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Notes of the Month

WORLD COTTON TRADE IN 1959

In the third quarter of 1959, the cotton industry throughout the world continued to enjoy a high rate of activity. According to the latest Quarterly Statistical Review by the Cotton Board cotton yarn output in those non-Communist countries for which regular figures are available—including all the major exporting countries—suffered a smaller-than-usual seasonal decline, being about 9% greater than in the corresponding period of 1958. The greater part of the global increase was accounted for by the U.S.A., where yarn output in the third quarter was 17% greater than a year earlier. Japan, India, the U.K. and most of the continental West European industries were also producing at a greater rate. World trade in cotton piece-goods also continued its marked expansion during the quarter. Compared with corresponding periods of 1958 exports from non-Communist countries showed a decline of about 10% in the first quarter but the second and third quarters revealed increases of about 4% and 18% respectively. By far the greatest increase, compared with a year earlier, was achieved by India but exports from Japan, Hong Kong and all the main continental West European countries except Portugal and Italy also showed sizeable increases. Exports from the U.K. and the U.S.A., however, were less than in the third period of 1958.

Although exports of man-made fibre fabrics from non-Communist countries in the third quarter were no greater than in the second quarter they were roughly 3% greater than in the third quarter of 1958. This contrasts with their relatively depressed performance in the first half of this year when they were some 13% less than in the corresponding months of last year. Japanese exports were still running below their 1958 level, as also were shipments from the U.K. In contrast, exports from the U.S.A. and most of the continental Western European countries were greater than a year earlier, the expansion being particularly marked in the case of Italy.

In the U.K. cotton industry, the rate of yarn output per working day in October was the highest for any month since March 1958 and 13% greater than the low point reached in January this year. There was, however, a 2% decline in production in November caused by the closure of mills under the reorganisation scheme and the consequent, possibly temporary, loss of labour. Nevertheless, output per head in spinning had increased by about 4% since June. Between June and November the rate of output of cotton and cotton waste yarn declined by about 4% while that of spun man-made fibre and mixture yarn increased by about 10%. Cloth production in October was roughly 13% greater than the January low point. Since July there has been a tendency for the rate of output of cotton cloth to contract slightly and for that of man-made fibre and mixture cloth to expand. This expansion has been most marked in the case of tyre fabric and other continuous filament fabrics, especially those made of synthetic yarns.

Commenting on the changed marketing since last Spring, the Review states that official statistics indicate that consumers' expenditure on clothing in the second and third quarters of this year, corrected for price changes, was only 5% greater than in the same months of 1958. The improved rate of ordering began as the result of the change from a de-stocking to a re-stocking phase, prompted in part by an upward movement in raw cotton prices. This change in market sentiment seemed virtually world-wide. When it became clear that much more machinery was to be scrapped under the reorganisation schemes than many had expected, an additional element entered the situation. Many buyers, faced by the prospective disappearance of customary sources of supply placed orders well in excess of normal requirements. This pushed delivery dates a long way back—a process which many producers resisted by closing order books from time to time—and prices tended to rise from what, in many cases, were uneconomic levels.

Exports of cotton piece goods were again disappointing in the third quarter, totalling only 81 million sq. yds. against 86 million in the second quarter and 88 million in the third quarter of 1958. The October figure of 31 million sq. yds. was well in excess of the October, 1958, figure. Compared with a year earlier the main decreases in the third quarter were in shipments to Australia and New Zealand, while there were also reductions in trade with French Africa, the West Indies, British East Africa and Ceylon. In contrast there were considerable increases in exports to Rhodesia and Nyasaland and to Burma, the latter increase being a consequence of the triangular deal arrangements. There was also some improvement in shipments to the U.S.A. and Canada. Exports of man-made fibre piece goods in the third quarter were also less than a year earlier, reductions in shipments to Australia, New Zealand, the Irish Republic, South Africa and British West Africa being only partly compensated for by increases to Rhodesia and Nyasaland and to Cyprus. Exports of cotton yarn were still running much below the 1958 level in the third quarter of this year.

Imports of cotton piece goods reached a new record level of 127 million sq. yds. in the third quarter, compared with 116 million in the second quarter and 75 million in the third quarter of 1958, and in October totalled 50 million sq. yds. Imports from Hong Kong tended to decline but as the restrictions took effect imports from Pakistan expanded notably in the third quarter and there were also increases in arrivals from India, China and Spain. In October imports from both India and Pakistan probably

exceeded the rate to which they will be limited from January, 1960, onwards.

The situation in the U.S.A. remained favourable. The average margin between raw cotton and loom-state cloth prices continued to widen, reaching 31·41 cents per lb. in September compared with 22·24 cents in September, 1958; this is the widest margin for about six years. The ratio of unfilled orders to weekly production during the summer months was the greatest since the Korean boom. Mill consumption of raw cotton in the third quarter was 17% greater than in the third quarter of last year, while over the same period consumption of rayon and synthetic staple increased by 7% and 61% respectively. The rate of cotton consumption continued at a high level in October. The latest figures of cloth production relate to the second quarter when there were increases in comparison with the same period of 1958 of 9% in the case of cotton cloth and 27% in the case of synthetic fibre cloth; rayon cloth production, on the other hand, was 2% less than a year earlier.

Exports of cotton piece goods from the U.S. decreased to a level of 108 million sq. yds. in the third quarter of 1959 compared with 118 million in the second quarter and 112 million in the third quarter of 1958. Exports of man-made fibre piece goods totalled 42 million sq. yds. in the third quarter, much the same as in the second quarter but well above the 33 million sq. yds. recorded in the third quarter of last year. The increase was almost entirely confined to synthetic fibre fabrics. Import statistics reveal that cotton piece-goods as well as made-up goods had been reaching the U.S. in increasing quantities from Hong Kong. There was also a steady expansion in imports of Japanese rayon piece goods.

In Japan, output of all the main classes of production, with the exception of cotton cloth, was greater in the third quarter than in the second quarter, and without exception production was considerably greater than in the corresponding quarter of 1958. Cotton yarn and cotton cloth increases were 8% and 12% respectively, while high rates of increase were recorded in the case of spun synthetic yarn and synthetic fibre fabrics. It is expected that losses in output in the fourth quarter due to the extensive typhoon damage will be made good by a further easing of the production curtailment measures, and special measures have been taken to meet export commitments.

Exports of cotton piece goods from Japan recovered somewhat to a level of 314 million sq. yds. in the third quarter, compared with 295 million in the preceding quarter and 277 million in the corresponding period of 1958. Nevertheless, the level of export trade remained well below that achieved in 1957. The biggest increases compared with the third quarter of 1958 were in exports to the U.K., Australia, Hong Kong, Burma, Thailand and Venezuela, while trade with South Africa, British East Africa and Singapore also showed some expansion.

Mill production of cotton cloth in India in the third quarter was very slightly greater than in the third quarter of 1958, although it remained below the level of output in the years 1954 to 1957. Cotton yarn production, on the other hand, has been consistently 2 or 3% better than in the corresponding period of 1958 ever since the beginning of this year and is running at a rate which has only been surpassed in 1957. The main reason for the relatively depressed level of cloth output this year is that stocks have continued to be run down and some concern has been expressed about the supply position. It is reported that the Government has licensed five new units for the manufacture of automatic looms to facilitate the modernisation of the textile mill industry. Final figures for exports of cotton piece goods in the third quarter of 1959 are not yet available, but they are expected to reveal a massive increase and may reach the highest total for any quarter since the first quarter of 1957.

Cotton yarn production in continental Western Europe as a whole in the third quarter was 2 or 3% greater than in the corresponding period of 1958; in the first quarter it was about 12% less than a year earlier and in the second quarter about the same as a year earlier. Italy, Belgium, the Netherlands and, to a lesser extent, Germany were all producing at a greater rate in the third quarter of this year than in the third quarter of last year. The level of output in France, however, was still below that of a year ago. In almost all countries surplus stocks had been liquidated and producers were able to lengthen order books considerably. In most cases margins improved. In Spain a commission representing the mill-owners reported that their industry is no longer competitive in modern conditions and advocated a drastic re-organisation involving the scrapping of a quarter of the machinery, the renovation of the remainder and the installation of new machinery.

COTTON MILL PROFITS IN 1959

A big fall took place in the profits announced by British cotton companies during 1959. Earnings were at their lowest level since before the outbreak of war in 1939. Total net profits, after tax, of 96 companies, owning more than 300 mills, were £3,496,987 against £6,363,413 in 1958 and £8,216,462 in 1957. These results reflected the adverse trading position which was not reversed until the second half of last year. The mills have now built up massive order books and have business in hand which should keep all available machinery working until the autumn. Average profits announced in 1960 should show a remarkable transformation. According to an independent analysis of trading results (by F. W. Tattersall Ltd.), net earnings announced by 14 leading spinning and weaving combines and their subsidiaries last year amounted to £1,683,559 compared with £3,305,898 in 1958. The average profit was £120,254 per group against £236,136. The average dividend paid was 9·73% against 10·79% and total credit balances were £8,741,234 against £9,305,583.

Average profits announced by 40 independent spinning mills during 1959 were £5,978 per company compared with an average of £25,099 for 45 firms in 1958 and £26,245 for 51 concerns in 1957. The average dividend paid by 40 spinning mills last year was 13·12% against 18·51% for 45 companies in 1958. Average profits earned by 20 concerns combining spinning and weaving was £57,736 per company last year compared with £70,157 in 1958. The average dividend for the 20 companies are 10·18% against 10·62%. For the whole of the 60 firms, the average profit announced was £23,230 in 1959 against £40,782 for the same concerns in 1958, while the dividend for 60 companies last year averaged 12·16% against 15·14% in 1958. All these companies now have credit balances totalling £9,366,110 an average of £156,102. A year ago 64 firms had credit balances amounting to £10,849,713, an average of £169,527. Average profits of 22 companies engaged mainly in weaving were £19,073 per firm against £30,548 in 1958. Dividends averaged 6·64% against 4·70% in the previous year and credit balances amounted on average to £101,966 per company against £102,490. In 1959 capital reductions were made by six spinning firms, the aggregate original capital being reduced from £1,634,554 to £843,189.

Textile Mill Maintenance

Operation and maintenance of piping installations for steam, water or air, etc., also features in high speed, single-stage and double cylinder air compressors. Efficient maintenance should include a log showing daily record of hours run, average pressure, power input and amount of compressed air delivered, oil consumption, etc.

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THE incidence of increased maintenance caused by faulty usage cannot be over-emphasised. Serious damage can also accrue from irresponsible action, or actions prompted through inadequate knowledge such as might be expected from semi-skilled workmen. There is no doubt that continuance of the wartime practice of short period training for artisans is to be depreciated. A return to the full-term practical training apprenticeship, especially for millwrights, is essential; a feature that will become more apparent as industry increasingly resorts to "automation."

Lack of craft skill is often responsible for the unnecessary use of brute force. A classic example here is a workman trying to close a valve by using an extension bar to give additional purchase to the hand-wheel. Many a broken valve spindle has resulted from such treatment. Another failure is due, possibly through absent-mindedness, to a man attempting to remove a blanking piece from the blind end in a steam main without first isolating the section on which he is working.

Piping Failure

Generally, piping failure can be a serious cause of trouble and thus, in order to avoid probable shut-down, the watchword should be "check weak spots." These, once found, can be repaired while using temporary piping —so avoiding interruption of services. Leakage of gaskets and threaded joints on steam mains are often a persistent source of bother. The former may be caused by vibration or lack of resilience in the steam system and the latter is usually caused by severe temperature change taking place, thus subjecting the joint to considerable "working" which may open up the normally satisfactory joint. Both faults can be attributed to faulty installation and need modification to rectify them. The solution of the leaky threaded joint problem, for example, calls for the use of socket weld valves and fittings and the services of a competent welder.

The foregoing stresses the need for the maintenance department to check all steam mains for faulty layout. By doing this, and by immediately correcting all faults, constant small troubles, or even major breakdown may be avoided. Care should be taken that all steam mains have a good, unimpeded fall, preferably in the direction of steam flow, towards drain points. This flow should not be less than $\frac{1}{2}$ in. in 10 ft. This desirable fall may sometimes produce a problem regarding head-room available. For example, a main 500 ft. long allowing for a fall of $\frac{1}{2}$ in. in 10 ft. will drop 25 ins. over its length. To avoid this decrease of headroom in a mill, it is common practice to introduce a system of relaying the main; the relay point also serves as a suitable drain point.

Pipes fitted cold will naturally expand when heated, and there is no purpose in laying a pipe line with proper falls, drainage points, etc., if immediately steam is turned on, expansion causes distortion and throws the whole thing out of line. Some provision must therefore be made so that when the line receives steam the fall to the drainage point remains uninterrupted. In most layouts of small bore mains of short length and with plenty of bends, there is sufficient movement in the fittings to allow for expansion. Larger mains, raightts runs, and branches of a similar type require special consideration and expansion fittings are available for this purpose. When using these fittings care should be taken, however, that they do not form a low point for the collection of condensate.

Anchoring of the main at points between the expansion fittings is essential to make the expansion fitting do its designed job. If the main is allowed freedom of movement then there is nothing to make the fitting compress and take up the expansion. It has been shown that some types of expansion fittings exert a force opposite to their intended movement and the use of such fittings should be avoided in order to reduce the force on the anchor to a minimum. It should also be remembered that even if, according to the method of allowing for expansion, some free sideways movement of the pipe is permitted, the vertical movement must be limited so that it does not interfere with the general fall to the drain points.

Attention may be directed in this field of application to stainless steel bellows expansion joint, such as produced by Teddington Aircraft Controls Ltd. These are designed to accommodate thermal expansion, contraction, vibration, movement and the stresses and strains arising in all types of pipe work and associated equipment. Units are available, as shown in Fig. 14, with flanges at each end, or with pipe ends for welding, or one end of each kind. Alternatively, the bellows can be

Fig. 14. Teddington stainless steel bellows expansion joint fitted with flanges at both ends. This type of equipment is located directly in the mains to accommodate thermal expansion and contraction of the pipework

attached with special end pieces to mate with the equipment to which it is to be fixed.

Within a specified range of pressure and diameter, these bellows units may be used to accommodate thermal expansion and movement axially. It is, however, very important that the pipework is guided to ensure only linear, axial movement of the unit. Single rollers or pipe hangers are not suitable guides, as they permit side movement and pipe sway which tends to cause cockling of the expansion joint under pressure conditions. The guides should be installed close to the moving flange of the joint and may be made by providing an external tube on the pipe, not less than four times the nominal diameter long and with a sliding clearance not exceedingly $\frac{1}{16}$ in. the diameter, and clamping or welding the tube to a sub-anchor fitting.

Main anchors, designed to hold the pressure loads, are required at each end of every straight run of piping, whilst sub-anchors should be provided to divide the pipe into suitable lengths, each length having one bellows unit to compensate its expansion over the full pressure area. The sub-anchors need not be designed to take the relatively high loads due to pressure forces within the pipe-line. They must, however, be sufficiently rigid laterally and angularly to resist any tendency to sideways displacement or swivelling of the pipework.

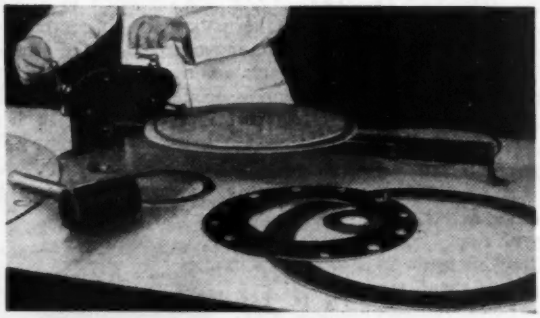
In those cases where a simple axial bellows unit permits objectionably large anchor loads from pressure forces, resort may be had to the use of the bellows in a bending motion instead of an axial movement; by providing the assembly with restraints or ties to contain the pressure loads. The simplest form of restraint is the tie-bar, and a single unit fitted with two tie-bars and sperical washers under the end nuts will allow bending through relatively small angles. A similar movement can be obtained by using hinged mechanisms, usually for higher pressures, or larger angular movements, whilst a double unit fitted with tie-bars (three or more) will accommodate large shearing movements. Two hinged single units placed in a line can also operate in a similar manner, but only in the plane of the hinges.

When re-making a leaky joint in a steam main proven jointing material should always be used, such as "Klingerit," "Walkerite" or jointings of similar quality. Irregular, worn or pitted flange faces can often prove a source of trouble to the maintenance gang, but sound joints may be made by using a liquid jointing in conjunction with solid jointings. An example here is "Lion" liquid jointing, which is resistant to high temperatures and combines high mechanical strength with sufficient resilience to take up expansion and contraction of metal parts. Wear in valve spindles can also be overcome to provide a leak-proof unit by a combination of "Klingerit" and "Klinger" fibre gland packing. In this case the gland packing is contained in header rings of "Klingerit" jointing cut to provide a neat fit at the top and bottom of the stuffing box.

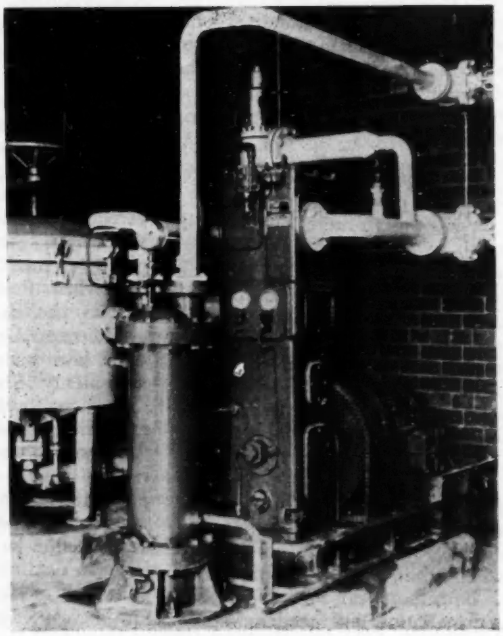
Cutting jointing rings from the sheet by hand-tools is not altogether a satisfactory method; it is time-expending and rough. The job is simplified, and a better ring produced, by the use of the machine illustrated in Fig. 15. Made by Richard Klinger Ltd., it is designed to cut rings up to an outside diameter of 48 ins. down to a minimum inside diameter of 2 ins. Speed of operation is, of course, one of the greatest advantages of the equipment; it takes less than 20 secs. to cut a "Klingerite" joint ring 24 ins. dia. and $\frac{1}{16}$ in. thickness.

Compressed Air Plant

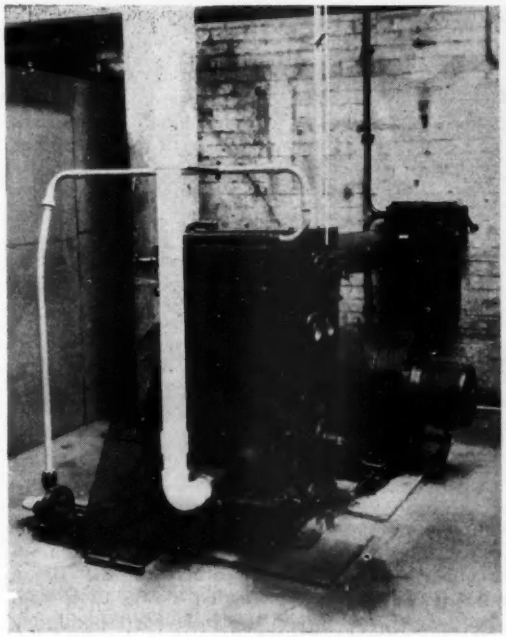
Increased resort to pneumatics as a power medium for process machinery, plant control and as a process aid, places compressed air high on the list of essential services in the majority of factories. Satisfactory usage here is dependent upon proper selection of plant, correct operation and efficient maintenance of plant and ancillary equipment. Importance of the latter cannot be over stressed. For example, when new and in first-class condition, a compressor delivering 500 cu. ft. of free air per minute at a pressure of 100 lbs./sq. in. and running for 120 hours per week will, with electric current at say 1½d. per kW hr., incurs



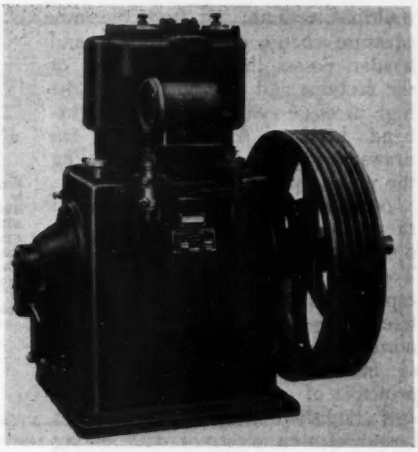
(above) Fig. 15. This machine takes less than 20 secs. to cut a "Klingerit" ring 24 ins. in dia. and $\frac{1}{16}$ in. thickness



(right) Fig. 16. The "Tilghman" air compressor shown here has a capacity of 100 cu. ft. of free air per minute. It is fitted with carbon piston and piston-rod stuffing box rings to ensure there is no lubricant contamination by the delivered air



(left) Fig. 17. The aftercooler to this compressor is a single acting single stage unit delivering 200 cu. ft. of free air per minute at a pressure of 100 lbs. p.s.i. It is built directly on to the compressor itself



(right) Fig. 18. "Broomwade" type D double cylinder air compressors are made in three sizes, delivering respectively—80, 150, and 200 cu. ft. of free air per minute at a pressure of 100 lbs./sq. in.

a yearly bill of £2,800. With care it is easy to maintain it in this efficient state of operation, but if this is not done it is just as easy to waste 10 or even 20% of the total cost of operation—or to increase operating costs by £280 to £560 over the year. These losses will increase considerably if the distribution system and ancillary appliances are not equally well maintained.

Fortunately, the user has a wide choice of exceedingly well designed machines; a small cross-section of which is now shown. In Fig. 16 is a compressor of particular interest to the textile industry; it is one of a range of machines, built in capacities from 50 to 3,000 c.f.m. and including both single- and two-stage types, designed in a manner ensuring no lubricant contamination of the delivered air. This objective is made possible by fitting the piston and piston-rod stuffing box with carbon rings which operate for long periods without lubrication and with comparatively little wear; also by making arrangements to prevent any part of the piston-rod in contact with lubricant from passing into the carbon stuffing box packing. Dry fabric intake air filters are, of course, used. To obviate the possibility of rusting in unlubricated areas, the design incorporates stainless steel valve plates, chromium plated piston rod, ni-resist iron liners, etc.

One of a new range of Tilghman high-speed single-stage air compressors is illustrated in Fig. 17. These are of the vertical truck piston design and are made in two types; the "Uniblock" single cylinder machines covering capacities from 20 to 200 c.f.m. and the "Twinblock" two-cylinder machines of from 200 to 400 c.f.m. output. Both types are totally enclosed and are provided with forced feed or splash lubrication, according to the size of machine. Automatic governing or unloading gear is fitted, whilst water-cooled cylinder jackets and valve covers ensure low working temperatures and high efficiency; the water jackets extend down to the crankcase and the oil is cooled as it is splashed on the surfaces of the water jacket. The valves employed are of the Horebigger multi-plate type, so giving maximum air flow with minimum frictional losses.

Many features are incorporated to facilitate maintenance. The design, as will be seen, ensures that no dust or dirt is harboured on the casing. All pressure castings are hydraulically tested to twice working pressure, an important safety factor where long periods of continuous running are involved, whilst the cylinder head is arranged with water jackets and integrally cast channels to connect up with water channels in the crankcase, so obviating the use of external piping. It is also arranged to allow easy removal of the valves for cleaning or inspection without the necessity of dismantling any other part of the machine.

The crankshaft is mounted in taper roller bearing journals designed to resist axial and radial thrust. A laminated shim adjustment is provided at the flywheel end to take up wear on these bearings. Another maintenance feature is the fitting of big-end bearings of the shell type pre-finished design. There is thus no need for shimming and scraping when renewal is necessary; they are replacable without removing the shaft or bedding in, so reducing maintenance time for the operation to a minimum.

Another make of compressor, a "Broomwade" Type D, double-cylinder machine is shown in Fig. 18. Here again, considerable attention has been given to the problem of trouble-free service with minimum maintenance; design features being robustness with ready accessibility to all working parts. Mechanically-operated suction valves are employed, opening and closing positively without shock and ensuring that the cylinders are always charged with air at atmospheric pressure without any wire-drawing. The delivery valves are of the automatic plate type, the plates being of such diameter that a small lift only is required to give free passage to the air.

The three compressors briefly described are watercooled. Some users, however, prefer air-cooled units, such as the Consolidated Pneumatic two-stage air-cooled compressor at Fig. 19. These include two- and four-cylinder designs, the former having one high and one low pressure cylinder and the latter two high and two low pressure cylinders. With each design the air passes from the first stage through an air-cooled intercooler of the radiator type, where its temperature is reduced to intake conditions. The cooler is composed of right-hand and left-hand headers and

multiple sections. Air from the low-pressure charge enters the left-hand header, passes through the inside of the sections and is discharged to the high pressure cylinder from the right-hand header. An intercooler fan draws air through the sections, cooling the air compressed in the first stage.

Attention might also be directed to the two-stage rotary compressors produced by Consolidated Pneumatic Tool Co. Ltd.; in five sizes covering a capacity range of 100 to 500 cu. ft. of free air per minute. F.A.D. at a normal operating pressure of 100 lbs./sq. in. It is claimed that the rotary principle of operation, which eliminates crankshaft, pistons and valves in favour of a simple rotor with sliding vanes, has cut the cost of upkeep and maintenance to negligible proportions. The rotors with their sliding vanes, rotate in a casing in an air/oil mixture which provides adequate lubrication and efficient air cooling. Lubricant-free air delivery is ensured by the incorporation of an effective oil separator.

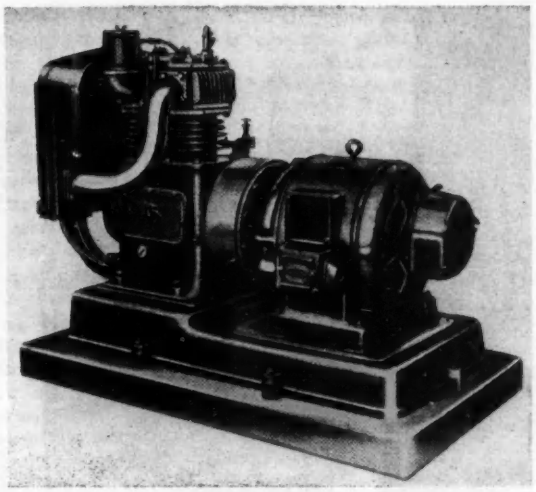


Fig. 19. Air-cooling is adopted in the design of the Consolidated Pneumatic range of Class P2 stage compressors. The air passes from the first stage through an air-cooled intercooler of the radiator type

Selection and Installation

Compressor selection should be based upon the closest possible estimate of the air consumption of all the pneumatic appliances likely to be used. It is helpful to layout the processes of the mill if at all possible, in such a manner that the demand for air is nearly constant. If these air requirements are large, running into several hundreds of cubic feet per minute, it may be advisable to have two or more compressors, the total output being say 10% more than requirements, and then to have a further unit as a stand-by. Should, however, the requirements be more modest, a single machine with another as a stand-by will be all that is necessary.

On the other hand, if it is considered that a stand-by is not needed, a complete set of additional valves should be held in order that the maintenance department may have resort to the system of periodical change. In those cases where the processes are such that high-peak demand for air cannot be avoided, it is advisable to install a machine to meet requirements during the normal call for compressed air, together with a smaller one which can be cut-in during periods of peak-load. This can quite easily be effected automatically, and is a very economical arrangement.

Compressor siting is most important. This should be chosen with some regard to the facilities afforded to the maintenance group. Full access should be allowed to all parts of a compressor for cleaning, lubricating, adjusting and effecting minor repairs; in such a manner that other parts do not have to be dismantled or disturbed. Instances do arise where the compressor is tucked away in some odd corner and receives inadequate attention. It should also be situated away from productive machinery, processes or operations which normally give rise to atmospheric contamination.

Probably the best location for compressors and auxiliary plant is in a separate room well ventilated, with good lighting, and maintained at uniform temperature. There is no reason why valuable space should be taken up by the air receiver. This is better located outside, but it must be remembered that this equipment is subject to inspection every 26 months; the inspector will want to see it under hydraulic pressure at some time. Furthermore, a drain or sump must be provided near the receiver, so that it can be drained of oil and moisture every day.

The importance of solid foundations for reciprocating compressors cannot be overemphasised; scientifically designed so that unbalanced forces in play when the machine is operating can be satisfactorily countered by the mass of the foundations. For permanent installations this mass will be in concrete, using a mixture of 1-2-4 ratio (one part cement, two parts sand and four parts washed gravel or rock). The concrete is poured while its temperature is between 40 and 120°F. All compressor manufacturers supply a foundation plan, showing the minimum depth they consider necessary for the satisfactory operation of a machine. The main feature to be remembered is, however, that the foundation must be constructed on firm ground, otherwise the depth should be carried down to a firm footing or the base correspondingly increased. It is also essential that the foundation is entirely separate from the building foundation and not touching any columns, piers or beams, in order to avoid the transmission of any vibration that might be present.

The unit is placed upon the foundation after it has thoroughly hardened and then carefully levelled, both crosswise and lengthwise, by placing wedges between the bottom of the base and the top of the foundation. These wedges should be placed as close to the foundation bolts as possible in order that no undue strain is placed on the unit when the bolts are drawn tight. A grouting cement (one part sand and one part cement) is then poured under the unit and worked well under the base; extending $\frac{1}{2}$ in. upon the side of the frame so that the base will have an equal bearing at all points. After this has been done, the grouting is trimmed away from the unit while it is still soft, so as to slope slightly and permit any oil that may collect to run off instead of soaking under the machine. Once the grouting has set, all wedges are removed to ensure that the unit is bearing on the grouting and not on the wedges.

It is good practice to install the air receiver in a position as close as possible to the compressor; to keep the discharge pipe short. Consideration must, however, be given to environmental temperature and if necessary compromise effected. Locating the receiver in the coolest place available results in maximum condensation of moisture and thereby

reduces air-line condensation. Fig. 20 illustrates the foregoing and other requirements. Furthermore, an undersize discharge pipe should never be used and it should have as few bends as possible. If the pipe is overhead it must be well supported to relieve all strains on the compressor cylinder, whilst any flange gaskets used in the line require to be of some oil-proof material; asbestos, if possible, as it resists heat and prevents leakage.

Conditions of operation are often such that considerable attention must be accorded to the problem of preventing the transmission of vibration from air compressor installations. Here it must be understood that if the transmission of vibration is to be reduced to an efficient degree, the natural frequency of the flexible mounting or material must be well below the disturbing frequency of vibration emanating from the machine; the two frequencies must not coincide, as this would cause resonance. Isolation may be carried out by mounting the machine on shock-absorbing devices, various types of which are now marketed, or as shown in Fig. 21, by floating[1] the unit, complete with foundation, on a cork or "Corisol" raft. Provision must, however, be made for fitting flexible piping on all connections to the compressor; to allow for the slight movement resulting from the resilient materials employed.

Three types of drive may be used; flat belt, V-belt and direct drive. The latter is, of course, to be preferred, but economies may dictate the lower initial cost of a belt-driven installation. In either case, certain precautions must be observed during installation. With belt drives care must be exercised to ensure that the motor and compressor pulleys are in proper alignment. Flat belts need to be approximately $\frac{1}{4}$ in. narrower than the face of the pulley, and should be soft and pliable to provide for a snug fit over the pulley and maintenance of the proper arc of contact. Another feature to be borne in mind is that a flat belt is tight enough when no stoppage occurs. It should never be tight enough to overload the bearings and cause heating.

V-belt drives are furnished with an adjustable motor base, which should be arranged to allow 2 ins. backward movement to ensure that the belts can be put over the pulleys without overstretching. It is advised that the slide rails are fitted by the cape and corner method. In this way one bolt is slackened by a certain number of

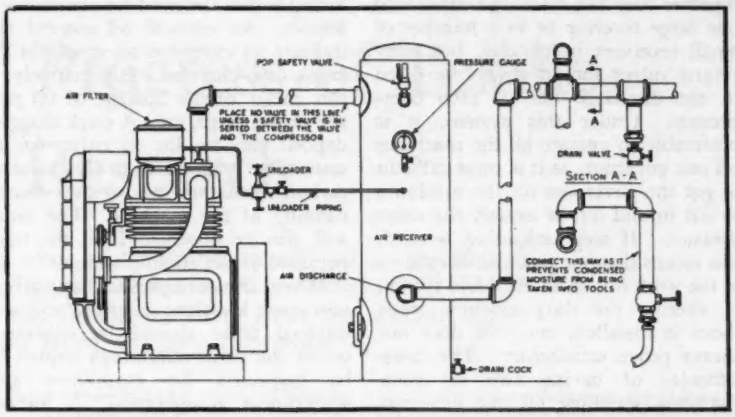

POP SAFETY VALVE
PRESSURE GAUGE
AIR FILTER
PLACE NO VALVE IN THIS LINE UNLESS A SAFETY VALVE IS INSERTED BETWEEN THE VALVE AND THE COMPRESSOR
UNLOADER
UNLOADER PIPING
AIR RECEIVER
AIR DISCHARGE
DRAIN COCK
DRAIN VALVE
SECTION A-A
CONNECT THIS WAY AS IT PREVENTS CONDENSED MOISTURE FROM BEING TAKEN INTO TOOLS

Fig. 20. Diagrammatic layout of compressor and air receiver with connecting pipework

turns and the other tightened by the same amount, ensuring that the alignment is always kept exactly the same when the adjustment is being made. Another means of aligning where taper lock pulleys are used, is to allow the motor pulley to be free on the shaft and to turn the compressor pulley with the ropes on, and the motor pulley should take up approximately its correct running position on the shaft, then the taper lock bush should be locked home.

In the case of a direct-coupled machine, both motor and compressor are aligned at the maker's works and dowelled in position on the combined bedplate or sub-base. Care should, however, be observed to ensure that the bedplate is not distorted or twisted when the unit is set down on the foundation. When levelled it is advisable to slip the coupling bolts and check the alignment to ensure that the preset positioning has not been upset by distortion. The bedplate is then grouted in the manner previously described. A further check may then be carried out by turning the compressor and motor by hand by means of the flywheel. If not turning over freely, the foundation bolts should be re-checked lest they have been pulled down unevenly.

After-coolers, where used, should be mounted on a small concrete plinth to prevent vibration, whilst the piping should be arranged in such a manner that withdrawal of the cooler for overhaul is possible without shutting down the compressor. It is also advisable to fit an oil and moisture separator after the after-cooler; equipped with an automatic drain trap. The air receiver itself should be lifted off the floor by three 12 ins. cube concrete blocks to permit easy drainage and also for inspection by H.M. factory inspectors.

With water-cooled compressors it is also advisable to give consideration to the installation of a mechanical water cooler; where water economy is an important factor. These auxiliary equipments, working on the re-circulating principle and saving 99% of the water circulated, may be installed in any position inside or outside a building providing there is free access for air inlet at the back of the apparatus and free outlet for exhaust air from the fan providing for water cooling by evaporation.

The usual way of operating a system of one machine running and one stand-by is to have both machines discharge into a common air receiver and to fit a non-return valve in the discharge line of each compressor. On this set up it is quite in order for both machines to operate from one governor, and to fit isolating cocks on the air governor connection to the unloader so that the governor does not operate the stand-by machine. Where two or more machines are running

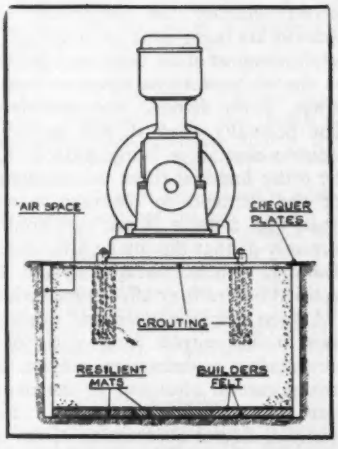


Fig. 21. The foundations may be isolated either by fitting shock absorbing mountings under the machine, or, as shown by floating the machine complete with foundations on a cork or "Corisal" raft

together they can discharge either into one large receiver or to a number of small receivers in parallel, but non-return valves should always be fitted in the discharge line of each compressor. Under this system, it is preferable to operate all the machines off one governor, as it is most difficult to get the governors on the machines to cut in and out at exactly the same pressure. If step unloading is used, this means that one machine does most of the work unless an elaborate system of altering the duty machine week about is installed, and this does not always prove satisfactory. The main difficulty of having two or more machines operating off one governor is that a current surge occurs when the machines are cutting in, but this can be overcome by fitting air-speed regulators.

Operation and Maintenance

Efficient maintenance is facilitated by proper plant operation. To this end, it is advisable to place a reliable man in charge of the plant and to ensure he keeps a log of operation. This should include a daily record of the hours run, average pressure, power input and amount of compressed air delivered; also the quantity of lubricating oil used and the times necessary to restore the sump level. The cooling water inlet and outlet temperatures need recording. It takes little effort, or time, to keep a log of this type and apart from its intrinsic value as a maintenance guide, it has a secondary value of psychological importance in that it keeps a plant attendant alert.

If the log is a faithful record it will tell whether the plant is functioning correctly or otherwise; indicated by a gradual decline in output. It will also record whether the pneumatic appliances are being kept up to the mark, by the amount of air used, as indicated by the air motor; an essential installation. If the demand increases above that normally used it will probably indicate that air is being wasted. On the other hand, if there is a tendency for the demand to decrease it will mean that a valve is not functioning correctly or that the intake filter needs cleaning. These features should be rectified before they affect production.

A keen machine attendant can also assist in the correct functioning of a preventative maintenance service by paying careful attention to the many signs of inefficient operation. For example, careful observation of the oil or water deposits drained from the receiver before starting a plant in the morning can indicate incorrect servicing and/or the need for maintenance service. An unusual oil content can indicate an excessive oil supply in the crank-case chamber. Alternatively, it can mean undue leakage of oil past the piston rings, etc. A thick sluggish deposit can be due to either (*a*) an unsuitable grade of oil or (*b*) excessive carbon formation due to over-heated running of the machine. The latter will also be observed from the temperature of the cooling water.

When the compressor is started, vibration, knocking in pipes and any unusual noise should be observed, whilst the valve mountings require to be inspected for cleanliness and smoothness of operation. A further feature to be logged is the time taken for a plant to obtain the design working pressure. Undue fluctuations or a definite increase in the required time period usually indicate wear or leakage. Thus the probable cause may be wear resulting in poor compression and reduced output, faulty valves retarding air inlet or delivery, leakage at some joint, gland or union on the compressor or receiver installation, or in the distribution system.

(*To be continued*)

Reference

(1) W. R. MacMillan, "Installation and Maintenance of Air Compressors and Ancillary Equipment"; reprinted from "Compressed Air and Hydraulics," Nov., Dec. 1957 and Jan. 1958.

Rot-Resistant Cotton Fabrics

By J. GRINDROD

A PRACTICAL method for producing cotton fabric claimed to have outstanding rot resistance and improved weather resistance was recently announced by the U.S. Department of Agriculture. The improved properties, imparted to cotton through use of a new research-developed chemical treatment, promise to open up new markets for cotton in awnings, tents, tarpaulins, etc.

Developed by U.S.D.A.'s Agricultural Research Service, the method is based on the use of a water soluble acid colloid of methylolmelamine, a chemical well known for its resin-forming qualities. The resin, which penetrates the outer portion of the fibre cell wall to become a part of the fibre rather than just a coating, is said to make cotton virtually immune to rot and mildew as determined by soil burial tests in the laboratory.

In these tests, using soils containing fabric-destroying bacteria, untreated cotton was in shreds after one week. The treated cotton fabric still retained 100% of its breaking strength after 21 weeks. Research by the A.R.S. Southern Utilisation Research and Development Division, New Orleans, La., has shown that the chemical treatment can be used in conjunction with certain fabric-colouring pigments to increase cotton's resistance to deterioration by sunshine. The treatment can also be applied successfully to many vat-dyed fabrics.

Technicians demonstrate the coating of fabric by a method commonly used in industry. An experimental coating is poured onto the fabric, as required, in front of "doctor blade" which spreads the coating evenly.

Extent of Progress of Textile Research

A brief account of some of the work carried out at the British Rayon Research Association has already appeared ("T.M.," Nov., page 488) and further extracts from the annual report are given on these two pages

BECAUSE it is easier to card 3-den. nylon than 1½-den. nylon, B.N.S. have asked the Association to investigate the weaving properties of 3-den. 1½-in. staple nylon spun to 24's c.c. on the cotton spinning system. The weaving properties have been investigated under the following conditions:—

(1) Size concentration—9, 14, 18 and 21%.

(2) Weaving conditions—normal, with heald slating and with mechanical slating using accelerators and retarders.

The conclusions are that, at low size contents, the warps are unweavable under any of the conditions in (2). The best conditions are high size content with mechanical slating without wax rods. Heald slating with wax rods gives almost as good performance.

Shiring

About a year ago the Association had shown that the frictional properties of the oil used on the weft were of major importance. It was deduced from the experimental observations that shiring should be reduced at high loom speeds and low warp tensions and this has been found to be so. It has also been shown by high speed films that the shiring starts at a point and spreads rapidly in a weft-ways direction. Further work indicated that by modifying the type of beat-up, it might be possible to eliminate shiring. The requirement is merely that the beat-up should be at a sufficiently high speed to avoid stick-slip motion of the weft along the warp. The use of a "spring-loaded" reed as fitted in the C. & K. S6 loom leads to a faster beat-up and gives some improvement under certain circumstances. The present situation is that, on certain looms at any rate, shiring can be produced at will, the variables being weft oil and loom settings. The Crepeing, Processing and Sizing Sub-Committee has suggested that the Association should now investigate the effect of warp size.

"Cloudiness" in Voiles

The work on nylon voiles of low construction has been held up, partly by the time required to obtain a warp on a precision beam for the C. & K. S6 loom and partly by work on weft bars. With the best settings, found empirically, the present situation is that a number of constructions have been woven with the following results:—

Construction	
80 × 80 (ends × picks)	good
80 × 76	fair
80 × 70	bad
80 × 60	bad (worst of the series)
80 × 50	bad
80 × 40	fair

These assessments are purely subjective and no measurements have been made on the regularity of yarn spacing in the cloth. We have been shown small samples of voiles, woven in France, which are free from cloudiness. Assuming that these samples are typical of production (it is quite easy to find small samples free from cloudiness in most voiles of low construction) they may indicate either that the yarn lubricant is different or that on the looms used in France the beat-up action is different (see remarks on shiring).

Weft Bars

Because of the difficulty experienced by some members in weaving good quality cloth from 45-den. nylon with 7½ t.p.i., a programme had been started in which cloth woven by the Association has been assessed for faults arising from periodicities in the yarn caused by the winding on the producer's bobbins, and faults arising from pirn winding. The cloth has been dyed under conditions which will develop rather than mask faults. The variables chosen are:—

(1) Cloth width, i.e., the important factor is the relation of the cloth width to the pirn chase period.

(2) Level of pirn winding tension and effect of variations in tension at each level.

(3) Effect of humidity and temperature on pirns wound at different tensions.

Work has been carried out with yarns uptwisted by B.N.S. and by B.R.R.A. This work is still in progress and other nylon yarns will be investigated in order to find out whether the conclusions based on 45-den. yarn (7½ t.p.i.) are generally valid. In collaboration with B.N.S. we are also investigating flat yarn. The preliminary conclusions are:—

(1) Barriness arising from the producer's bobbin is nearly always present, but it should be remembered that a dye which enhances this effect to a maximum amount has been used.

(2) The mean level of the tension up to about ½ gram/den. has little effect on cloth appearance in comparison with variations in tension during pirn winding.

(3) On a cloth whose width is *not* a multiple of the pirn chase period, the conditions of humidity and temperature under which the pirn is wound and stored do not influence the severity of weaving faults.

(4) With a cloth, the width of which is a multiple of the pirn chase period, there is some indication that diamond patterning can be accentuated when the pirn is wound and stored at high humidities.

The *tentative* conclusions for this yarn are that, with appropriate cloth width and reasonable control of pirn winding tensions, no faults should be produced in the cloth which are attributable to the pirn winding.

Pick Spacing

It has been established that the variations in the position of the cloth fell have a marked effect on the spacing of the weft yarns. A good deal of experimental work has been carried out to determine whether alterations in loom design can make pick-spacing less sensitive to cloth fell position. Two possible methods of achieving this have been investigated; the basic idea in both is to avoid the situation in which the beat-up force is determined by the position of the cloth fell. In one case the reaction of the beat-up on the cloth fell is controlled by a spring system. Some success has been achieved, but it is necessary to have low inertia, which can be obtained with a very light loom structure, and this requirement makes it unlikely that such a loom could be sufficiently rigid. At the present time "negative beat-up" is under investigation.

Warp Tension

The lease-rod tensiometer has been a reasonable success in the industry. No firm has bought sufficient, however, for an assessment of the use of the instrument for process control. Arrangements have, therefore, been made with a member firm for a sufficient number to be installed and operated under mill conditions for an evaluation of the equipment in maintaining a specified standard of quality.

In collaboration with W.I.R.A. the instrument has been developed for use in eliminating the weaving fault called "motion marking." In the B.R.R.A. development the recording system was heavily damped so that transient warp tensions were not recorded. In the W.I.R.A. application the interest is in the "transients" and not in slow changes in warp tension. The recording system has, therefore, been altered so that one can "tune" to the required frequency of tension variation. Apart from the application to sizing machinery, there may also be applications to printing machinery (with a member) and to the measurement of cloth tension on stenters.

Pirn Stability

The tension at which a pirn is wound is a compromise between the minimum tension required to prevent "sloughing-off" and a maximum tension above which the yarn is over-strained. The main factor

COAL-Mechanical Stokers

and the

CLEAN AIR ACT

As recently announced in the press, a new ministerial order permits the installation of mechanical coal burning equipment in Smoke Control Areas. It follows that the most modern and efficient plant should, of course, be installed on the lines of the latest Hodgkinson boiler house equipment.

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This stoker has separate drive and fan motors which our "Custodian" Panel controls by cutting in the fan at a predetermined period before the drive and cutting out the fan after the drive has stopped.
The "Meterfeed" Underfeed Stoker is designed for the utmost fuel economy **without smoke** and is available in a full range of sizes in both hopper and bunker feed models and suitable for boiler, kiln and furnace application. All models embody the controlled feed principle.

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The elevators in this range are made up from standard parts available from stock.

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controlling "sloughing-off" is the adhesion between the mandrel of the pirn and the yarn. In order to investigate this aspect more fully experiments have been carried out with grooved perspex pirns, the yarn being 150 d. c.f. viscose. Experiments with a few pirns demonstrated that much lower tensions could be used with the grooved pirn than with the standard pirn, efficient weaving could be obtained with winding tensions as low as 15 g. A small weaving trial was carried out at 15 g. and good efficiencies were obtained with the grooved pirn. However, further experiments on a well-tuned loom gave equally good performance with standard pirns wound at the same low tension. In order to determine whether the grooved pirn is less susceptible to weaving conditions than the standard pirn (both wound at low tension) a trial on a bigger scale is planned.

Another approach is to reduce the forces to which the yarn on the pirn is subjected during weaving. One way of achieving this is to build a spring in the base of the prin so that the yarn in the pirn is decelerated more slowly than the shuttle. Preliminary experiments are encouraging but have shown that the required spring characteristics are fairly critical.

Dyeing and Finishing

The dyeing and finishing department has been almost entirely occupied with work on finishing fabrics of continuous filament viscose yarns. Much of the initial work has been carried out on a plain woven filament viscose cloth, 86 × 56, ends × picks. The c.f. yarn is 150/40/2·5 t.p.i.

The difficulty of the problem, i.e., how to give c.f. viscose fabrics complete "minimum care" properties, is most easily understood when it is realised that a crease-recovery angle (by the B.C.I.R.A. test) of 110° is the threshold for acceptable crease resistance of spun viscose whereas for filament viscose cloths the threshold angle is 160°C. The reason for this is that the surface of filament cloths is such that even slight residual creases appear very prominent. Although commercially this disadvantage can be reduced to some extent by surface decoration or by the use of spun yarns either as weft or warp, the Association has concentrated on all-filament cloths because any measure of success with these might enable better finishes to be applied to spun/filament or all-spun cloths.

Three different groups of workers are engaged on different aspects of this problem and for convenience these three approaches are labelled:—

(1) Technology.
(2) Technological Research.
(3) Basic Research.

Technology.—This approach consists of the logical exploration of the effect of known variables of known processes for crease-resistance on finished cloth properties.

Technological Research.—The object of this work is to determine what particular property or combination of properties of fibre is necessary for the required degree of crease-resistance and crease-shedding and to explore the practicability, by alteration in yarn and cloth structures, of reducing the mechanical demands on the fibre.

Basic Research.—The object of this work is to obtain data on the effect of systematic chemical changes (substitution by different groups, cross-links of different kinds) on the physical and mechanical properties of cellulose.

The main variables which have been evaluated in the technological work are:—

(1) Nature of pretreatment of fabric—swelling by alkali has been investigated in detail.

(2) Nature and conditions of chemical treatment. The main systems which have been investigated so far are urea/formaldehyde, modified urea/formaldehyde, melamine/formaldehyde, ethylene cyclic urea/formaldehyde and acid/formaldehyde.

(3) Conditions of curing.

(4) Cloth structure. The variables initially selected (warp ends per inch constant) are filament number in weft, pickspacing and weft twist. Even with these few variables, 96 different cloths have been woven and work on finishing them is just starting.

The detailed results will not be given here, but at this stage, the conclusions are:—

(1) Certain alkali pre-swelling treatments can give a marked improvement in wet crease-shedding but do not improve the dry crease-shedding.

(2) In combinations of alkali pre-swelling treatments followed by resin treatments, at low resin contents some of the ability to recover from wet creasing is retained but at sufficiently high resin contents for dry crease recovery the additional ability to recover from wet creasing is lost.

(3) High dry crease-recovery on the systems investigated is always associated with lower abrasion and tear resistance.

With the systems, which have been investigated, it appears that the only way of proceeding further is to find a practical compromise between crease-shedding and reduction in tear and abrasion resistance, moving the position of compromise as far as possible in the required direction by method of processing and the use of lubricants and other surface agents after or with the resin treatment.

In technological research two aspects have been chosen. The first is a study of fibre lubrication. Most of the year has been spent in developing a reliable tool for measuring fibre-to-fibre friction and thus to be able to assess the value of a large number of lubricants. The other aspect has been to devise a reliable method of measuring the strains imposed on fibres when a fabric is creased. The method is to use fabrics of fibres which can be heat set. "Terylene" and "Tricel" have been used, so that a crease can be set in the fabric and then fibres can be removed from known parts of the crease and examined. The technique has been thoroughly proved and now different cloth constructions are being examined in order to find out whether there is a cloth construction which imposes the least strain on the fibres. Such a fabric construction should facilitate the work on obtaining a satisfactory crease-resistant material.

Desulphurising Viscose Fabrics

No further development on the pad liquor P.S.3 has been carried out but collaboration with members on its application has continued. In only one case was the treatment not completely satisfactory. The cloth in question had been sized with gelatine and then singed. The P.S.3 treatment desulphurised the cloth satisfactorily, but did not remove all the gelatine and this resulted in patchy dyeing. About 1,600 gallons of P.S.3 have been sold during the year.

Oil Stains

After the discussions with a joint panel of weavers and dyers and finishes, the Rayon Weaving Association and the Dyers of Man-made Fibre Fabrics Federation Ltd., it was decided that the "spotting agent" BRRASK AY should be marketed directly by Booth and Openshaw Ltd. Before taking any action a final meeting of the Oil Stains Committee was held and it was agreed that the committee should be disbanded as its work had been completed. Each batch of BRRASK AY is checked at the Association's laboratories and every complaint receives personal attention from either Booth and Openshaw or from the Association. The number of complaints has been small, and from experience over the past year the following points are worthy of note:—

(1) If it is proposed to "spot" acetate cloths, the weaver should discuss this with his dyer and finisher.

(2) Although they are good, BRRASK spotting agents are not infallible, for instance they cannot always clean cloth in which the yarn has been soiled by previous processing.

Pad Scours

Two pad scours are undergoing trials in member firms. The first of these, P.S.1. was developed as an overall scour to remove spotting rings on bright and matt acetate. Subsequently P.S.4 was developed for the purpose of cleaning cloth without spotting. Some 140 gallons of P.S.1. have been sold; the sales of P.S.4 amount to almost 4,000 gallons over the past year and the monthly rate is at present between 500 and 600 gallons. P.S.4 and P.S.1 are only supplied after consultation with the Association as we wish to examine their use, in collaboration with members, further before release for normal marketing.

Raising

The value of the instrument for measuring the degree of raising is still being assessed. Apart from work on cloth supplied by members, cloths of various types raised at Shirley Institute have been supplied by the B.C.I.R.A. One mill trial on the use of the instrument for quality control has taken place and further mill trials are being planned.

Hattersley Adopt "Unifil"

A joint announcement by Leesona Corporation and George Hattersley and Sons Ltd., Keighley, states that work is proceeding with the application of the "Unifil" loom winder on Hattersley's Model 382 filament rayon loom. The work is expected to be completed next Spring, when full details will be released.

* * *

B.C.L. Expand at Barrow-in-Furness

British Cellophane Ltd. have begun the first stage of expansion at their new £3,000,000 factory at Barrow-in-Furness. Production started at Barrow early in 1959 to meet increasing demand for "Cellophane," and demand has continued to rise during 1959. The new plant will be in production by July, 1960.

Fuel Economies in Power and Process Requirements

ACCORDING to the recently issued fifth annual report, the work of the National Industrial Fuel Efficiency Service has been more productive and more successful than ever before. At the beginning of the year, the bookings in hand were substantial and, month by month, the volume of new work secured had been consistently high. The total value of bookings made during 1958 - 59 was 31% greater than in the previous year. Summing up the five years' work the report states:—

(1) N.I.F.E.S. has made contact with the great majority of fuel users within its field of activity and maintains contact by over 12,000 factory visits a year.

(2) The number of fuel consumers for whom detailed work has been carried out on a fee-paying basis now exceeds 4,300.

(3) The potential for saving as determined by heat and power surveys is over 20% of the mean annual fuel consumption, in a wide range of industries.

(4) These savings are being realised by continuing co-operation between the firms and N.I.F.E.S. engineers under the regular service agreement system.

(5) N.I.F.E.S. work is extending further into industrial processes, with the direct effect of improving productivity. How this is welcomed, even by large firms with substantial technical resources, is illustrated in a section entitled "Process and Productivity" in the report.

Citing case histories, the report states that the regular service to the member firms of the Wool Textile Delegation provides many examples of steady improvement in the operation of boiler plants, although they are not generally supported by full-scale measurements of efficiency owing to the nature of the agreement. However, efficiency can be fairly inferred from the reduction in flue gas losses and the firms are certainly in a position to appreciate the reduction in their fuel consumption. Humphrey Bradley Ltd., Morley, joined the scheme in January, 1955, because they were as much concerned with smoke emission as with fuel efficiency. The smoke nuisance has been kept under control for the last four years and fuel consumption has been reduced by 19%. The Lancashire boiler, which is fitted with a mechanical stoker and feedwater economiser, is now operating at an efficiency of 72%.

Another mill in the textile industry where the prevention of atmospheric pollution has gone hand in hand with improvement in plant performance, is that of Ormerod Brothers Ltd., Brighouse. Their plant, consisting of two Lancashire boilers with feedwater economiser, was surveyed in October, 1956, when the efficiency was found to be 66·6%. The mechanical stokers were in poor condition and the steam jets were extravagant. The stokers were renewed, the instruments repaired and fan forced draught was installed instead of steam jets; under regular service the efficiency has been raised to 72%, the figure forecast in the first report.

Cotton Finishing

In the finishing of cotton textiles, the cost of fuel may amount to over 10% of the total manufacturing costs, so that improvements in efficiency are of considerable importance. Detailed studies of the use of steam have now been made by N.I.F.E.S. at 30 works in Lancashire alone and show average savings of 15%, equivalent in total to 18,500 tons per annum. These savings are additional to those obtainable in the boiler plants. The average efficiency of the boilers surveyed was 65% and can be raised to 72%, a figure a little lower than the target suggested in last year's survey

The main uses of steam are for heating the kiers, in which cotton pieces are brought to the boil under pressure before being bleached, and the cylinders and stenters, in which the cloth is subsequently dried. The recommendation that has been most commonly made has been to improve the lagging. Although steam and condensate pipes may be well insulated, process plant is generally forgotten. Only one firm was found to have insulated its kiers and none had insulated the ends of its drying cylinders.

Kiers used in the bleaching trade are generally vertical cylinders, about 8 ft. in dia. and 8 ft. in height. If live steam is used to heat the liquor in the kiers, it also serves to maintain circulation. If heating is by means of an external tubular heat exchanger, a circulating pump must be provided. The steam demand fluctuates widely; when starting to heat a kier it is likely to be as high as 5,000 lbs./hr., which is ultimately reduced to about 500 lbs./hr. The effect on the boiler plant of starting several kiers at the same time can well be imagined.

Detailed tests have been carried out on a vertical kier at Alexander Carus Ltd., Hoddlesden. The heat lost from the exposed sheel was equivalent to 746 lbs. of steam when bringing the kier to the boil and 2,170 lbs. during the simmering period, in addition to 480 lbs. to make good losses from the heat exchanger. It was estimated that lagging would reduce these losses by 85% and result in a saving of 1 ton of coal a week. The kiers have been lagged and covered with a waterproof coating; subsequent tests have confirmed the saving and shown that it was sufficient to recover the costs of insulation in about 6 months.

As clear a demonstration of the value of lagging as could be wished for is that, when it had been completed at one works, it was necessary to fit a ¼-in. control valve to bypass the main valve, which had become too coarse to control the reduced flow of steam during simmering. Again, it is generally necessary to install a circulating pump after lagging kiers, in which live steam was previously relied upon for circulating the liquor, as the amount available during the simmering period is then no longer adequate.

At the conclusion of the boil, large quantities of steam are blown to waste when lowering the kiers to atmospheric pressure. Tests carried out on three kiers showed that 2,000 lbs. of steam were released, which could be used to heat the liquor to 170°F. for the next cycle. Apart from the direct saving, this storage of liquor at high temperatures obviously reduces the next peak demand on the boiler plant.

The insulation of the ends of drying machines has rarely been undertaken in the past, although it is not only economical but leads to an improvement of the working conditions in the factory. The heat loss from the ends of a single cylinder of standard size, 22 ins. in dia. is equivalent to 0·8 tons of coal a year. A typical machine contains 25 to 30 of these cylinders and, throughout the industry, there must be 10,000 cylinders in constant use.

Stentering fabrics is one of the most expensive operations in finishing, from the point of view of heat requirements. Stenters may well absorb 10% to 20% of the total steam generated. Excessive losses of heat occur due to lack of insulation, to structures that are too large in size for the throughput, and to leakages of hot air. Tests made by N.I.F.E.S. at Heaton Mills Bleaching Co., Blackley, provide an example of the savings that can be made. Comparison of the performance of open and closed stenters showed that the specific steam consumption in the former was 7·4 lbs. per lb. of moisture evaporated, or nearly three times the consumption of the latter. On N.I.F.E.S. recommendation, the firm built an enclosure round the open stenter and constructed a duct to recirculate air to the tubular heater, which was thoroughly cleaned. As a result, not only was there a saving of 200 lbs. of steam an hour, but the speed of the machine could be increased by at least 40%, thus increasing production. At the same time, working conditions were improved by carrying the moist air in a duct through the roof instead of discharging it into the stenter house.

There is considerable scope in this industry for the generation of back-pressure electricity, as steam can generally be used at low pressure for bleaching and dyeing while the power and heat requirements are in reasonable balance. A typical example is provided by the Belmont Bleaching and Dyeing Co. Ltd., near Bolton. The boiler plant was nearing the end of its useful life and difficulty was experienced in avoiding smoke emission. The boilers were replaced by new ones designed to work at 200 p.s.i. gauge, fitted with chain-grate stokers and two 150 kW engine-driven alternators were installed. These engines exhausted to a back-pressure of 30 p.s.i. gauge through superheaters to avoid passing wet steam to the works. The new power plant has now been in operation for six months, generating 270 kW during the day-time; the smaller amount of power needed during the night is purchased from

the public supply. The steam and power balance is good but some improvements can still be made. The coal cost per ton has been reduced due to the ability of the new stokers to use a lower grade fuel.

The overall effect of such improvements in process and power generation are well illustrated in the story of N.I.F.E.S. collaboration with the Rainshore Bleaching and Dyeing Co. Ltd. N.I.F.E.S. was first called upon, in 1955, because the firm was experiencing difficulty in maintaining steam pressures and with smoke emission. While opportunities to improve combustion efficiency have not been overlooked, the main savings have been found outside the boiler plant, as is so often the case.

The main recommendations from the first survey were that the firm should scrap its condensing engine and modify the back-pressure engine to increase its performance; the balance of the power required should be purchased from the Electricity Board. Later, the back-pressure engine developed a serious fault, so that the whole of the power requirements are now met from the public supply. The financial results have been most satisfactory, as there is a net saving of £11,300 per annum for a capital expenditure of £12,000.

On the process side, improvments to the kiers, drying cylinders and stenter along the lines described above have been carried out. In consequence, the firm has been able to install additional plant and raise its production substantially, without providing for additional boiler capacity. Fuel and power costs are now reduced to 7½% of total manufacturing costs, as compared with the figure of 10% which is typical of the industry.

Jute

Last year's survey reported the results of a survey carried out for the British Jute Trade Research Association, the Council of which had chosen six firms as a representative cross-section for investigation. The work was comprehensive in character, including not only steam-raising and power production, but space-heating and humidifying, important factors in determining fuel consumption in this industry, as well as the use of steam for process. In total, the report showed that savings of 6,000 tons per annum could be made out of a consumption of 17,000 tons per annum. Progress is now being made by the six firms in carrying out the recommendations made to them. For example, Thomson and Shepherd Ltd., of Dundee, have plans under way for the recovery of waste heat from dye liquor passing into drains; they have already scrapped their turbine and, as recommended, are purchasing additional power from the public supply at a saving of £3,000 per annum.

N.I.F.E.S. report was well received at a meeting called by the Jute Trade Research Association to consider it, and this has led to work at seven more mills in the trade. As the results of carrying out the recommendations at the first six firms became known, enquiries for N.I.F.E.S. services have been received from five additional firms.

More Wool Trade with Japan

The chairman of the Eastern Shipping Conference, which represents major shipping companies trading to Asia, has forecast record wool shipments to Japan. It is expected that 1,000,000 bales of wool will be shipped to Japan this year, 60,000 more than last year's total.

Fibre Motion on a Card

THE complementary ideas of the average time a fibre takes to pass through a carding part (delay factor) and the loading on the part were discussed at a recent lecture to Bury Textile Society by Messrs. R. T. D. Richards and P. D. Jowett of the Wool Industries Research Association, Leeds. This delay is due to the doffer and workers taking only a small fraction of the fibres presented to them by the swift. In an example where the rate of feed to the machine was 30 lb./hr. and the doffer took only a tenth of the fibres presented to it, fibres were being carried over the swift at a rate of 300 lb./hr. and back under it at 270 lb./hr. The 300 lb./hr. rate is a truer representation of the rate at which the card handles fibres than the 30 lb./hr. rate. The importance of the delay factor is that when multiplied by the rate of feed per swift revolution it gives the total loading on the swift and workers. Thus for a feed rate of 30 lb./hr. (just over 2 drams/sec.) with a swift speed of 60 rev./min. and a delay factor of 30 secs., the total loading of workable fibres on the swift and workers would be 60 drams.

The delay factor is the average time that a fibre takes to pass from the feed rollers to the doffer. Some fibres travel as quickly as possible whereas others may spend some time on the workers and may then not be picked up by the doffer for a number of swift revolutions. Delay of fibres is also a feature of worsted, cotton condenser and cotton flat cards. When considering a number of carding parts, the overall delay factor is the sum of the delay factors for the individual single parts. Thus for a scribbler with three swifts each with a delay factor of 40 secs., the overall delay factor is 120 secs. If a tuft of coloured fibres were fed to a part carding white fibres, coloured fibres would be spread over many yards of web coming from the doffer. This illustrates the great mixing power of a carding machine as a result of its delay factor. A mill test showed how much mixing did occur. The black and white fibres usually mixed in blending to produce a grey yarn were blended separately and fed to either side of the hopper. The half black, half white sliver produced at the Scotch feed was fed into the carder part. Although the fibre mixing at the slubbing was not as good as it would have been had the mixing been done in blending; it was apparent that the carder part alone could achieve much of the mixing required.

The smoothing property of the scribbler was illustrated by a calculation in which the weight of the Scotch feed sliver at the end of a two-part scribbler was calculated when the hopper missed a weigh. The cycle time of the hopper and the delay-factor of each swift were each 40 secs. The weight of the sliver at its thinnest point was about two-thirds of its normal weight and the measurable deviation lasted about 4 mins. This shows that there is sufficient smoothing of variations to make weigh-to-weigh variation at the hopper unimportant.

Accuracy between *groups* of weighs is very important, so that hopper reliability is more important than is its accuracy between individual weighs. In one test the hopper was made to deliver a weigh of about 5¼ ozs. every 40 secs. and the variation between weighs was measured. The weight of the weigh was then changed to 11 ozs. and the cycle time to 80 secs. Although the variation between weighs for the 5¼-oz. weigh was nearly three times that for the 11-oz. weigh, there was no difference in slubbing variations using the two hopper settings.

The effect of the various rollers on the delay factor was described. Experiments at Torridon using a single-part, Garnett-covered machine showed that the delay factor was reduced by:—

(1) Increasing the speed of the doffer.
(2) Reversing the direction of rotation of the workers.
(3) Reducing the number of workers.

Changing the speeds of the workers or strippers had little effect on the delay factor. These results were confirmed by tests carried out on fillet-clothed machines. The most important result is the great effect of doffer speed on the delay factor. This stresses the importance of ensuring that doffer surface speeds are kept constant when other machine parameters are being compared.

Attention was then drawn to the condenser end of the carding machine where variations could be produced but where there was not enough of a fibre reservoir to level them out. Care must be taken in layering the parallel fibre feed to the carder part and smooth motion of the workers. One source of variation was the setting region between the last swift and the tape or ring doffer. In a woollen carding machine the spacing between these rollers may be 0·010 to 0·020 in. and for a cotton flat card around 0·005 in. If this gap varied by only 0·002 in. the doffer would take a varying amount of fibre and serious variations would be produced in the output, which would, of course, appear as count variation in the yarn. Examples were quoted of fabric faults which had been produced by eccentricity in the tape doffer and by the last carder swift.

The delay factor is important to the carding engineer to enable him to understand the carding process fully. It is also vital to the final design of process controllers such as the Autocount. In this application it had been possible to assess the potentialities of many different control systems using the concept of delay factor without spending much time and money on experiments. As an example, a suggested alternative control system to the Autocount was discussed. The correction was to be made not at the condenser but earlier in the machine, where a less powerful variable speed drive could be used. One such system was to measure at the carder web and control the speed of feeding to the card. Analysis of this system, knowing the magnitude of the delay factors, showed that variations lasting less than about half an hour could not be reduced. In other words, the control would be so slow-acting as to be almost useless.

Man-Made Fibre Fabrics

Descriptions, warp and weft requirements, drawing-in particulars, ends and picks of a range of cloths including typewriter cloths, sharkskins, crepes, chiffons, parachute cloths, voiles, cloques, etc.

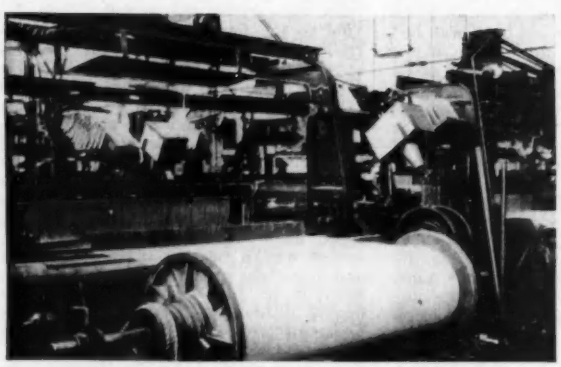
By W. MIDDLEBROOK

RAYON yarns have long established themselves as admirable selections for many beautiful fabrics, and it is only natural that rayon fabrics carry in the main the same names as their cotton, woollen or silken counterparts. Sometimes, in drapers' catalogues and advertisements, the cloth name is preceded with the word "rayon," but more often than not the customer takes for granted that a rayon fabric is being advertised. Dress fabrics, lingerie and furnishing fabrics are especially represented in the rayon group, such fabrics as *rayon taffeta*, *rayon brocade quilts*, *rayon lingerie crepe*, *Italian brocade* and *imitation fugi spun*, a spun rayon washing "silk." *Satinback bengaline* and *rich poult taffeta* are advertised as "black rayons," *black poult* being used for evening gowns and cocktail suits, being a rayon taffeta with a stiff, rustling finish. *Slipper satin*, a rich rayon satin for bedspreads, housecoats, evening gowns and bridal wear, is advertised along with *shantung-like rayon* for dresses and summer coats.

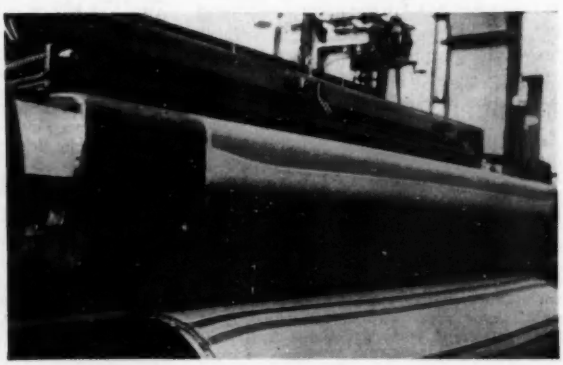
The quality of rayon yarns, whether viscose or acetate, makes them admirably suitable for weaving in silk looms but cotton looms will also weave them with very little alteration except that the raceboard needs to be covered with felt, swansdown or corduroy, and shuttles must be smooth and well furred, or tunneled to control the weft. One difficulty encountered on overpick types of Lancashire looms when weaving rayon and synthetic yarns is the problem of dirt but this can sometimes be overcome by wrapping the picking sticks with cloth and lining the shuttle boxes with felt or swansdown. Temples that are perfectly satisfactory for cotton or wool fabrics are not much use for rayon; rubber-covered rollers are essential. In addition, the take-up roller should be covered with fluted rubber tape or fine emery powder in place of the perforated tin used on the cotton loom. The rayon version of a *marquisette*, usually a gauze silk fabric, is made with 2/100s voile warp yarns and 150 den. rayon weft, with two ends per dent and every other dent empty to give the gauze effect. *Cristalline* is a matting cloth used for curtains, a matt weave with double ends and picks, and it may be wholly of cotton or rayon. Another example of a plain rayon fabric has 90 ends and 92 picks/in. of 60 den. bright viscose "S" twist; this is a light fabric that is apt to be shady unless carefully weighted, using "doll" or rocking weights at each side of the warp beam and rubber temples to hold out the cloth.

Type ribbon cloth is also a plain rayon fabric, but with a much closer weave, having 150 ends and 144 picks/in. of 50 den. rayon, 7½ turns; this cloth is woven on eight shafts, with six for the plain weave and two weaving tape or 2×2 for the selvedges, which are of real silk. With warp and weft of rayon, this fabric needs to be well templed, but better qualities may be made with silk crepe weft, weaving 2×2 "S" and "Z" twist, in which case temples are not required. A rayon fabric with a combination of 8-end satin and 2×2 matt weave is termed *sharkskin*, with the ground weave of 200 den. dull acetate and the satin stripe of 100 den. bright viscose on a separate beam, and 80 picks/in. of 200 den. dull acetate. By way of contrast, there is *angel skin* or *peau d'ange*, another dress fabric on a 12-end satin weave entered four ends per dent, with 350 ends of 75 den. rayon and 90 picks of 2/200s spun rayon per in. *Plissé satin* is an American rayon fabric with an 8-end satin weave, 300×100, 66 den. warp and 100 den. weft, all yarns having a crepe twist which tends to make the fabric "corrugated," as implied by the word *plissé*.

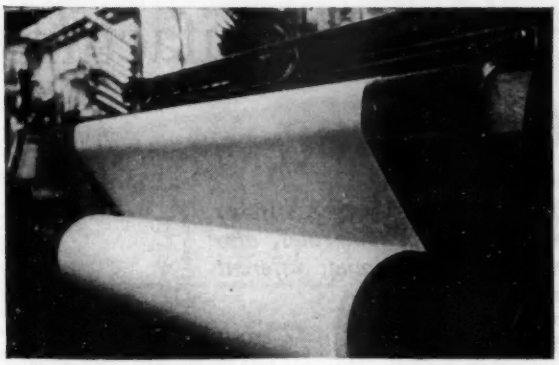
Sawdust crepe is an apt description for a rayon dress with a crepe weave that gives a harsh feel to the surface; a form of *sandcrepe*. Entirely different, a rayon fabric with a lustrous face, is *crepe soliel*, on a 5-end satin foundation; in



Back of loom weaving rayon filament warp



Weaving rayon crepe with weft-way striping



Nylon chiffon

fact, the name means "sunshine crepe." *Admiralty scarves*, once the pride of every sailor in the pre-war days when pure silk squares were issued, are now made with rayon, a light, 2×2 twill fabric with 140 ends/in. of 75 den. viscose rayon and 80 picks/in. of 2/40s rayon/silk mixture. The original "sailors' silks" were a yard square, being folded from two diagonal points to form a long, well-pressed scarf that went around the neck, with the knot hidden at the back by the blue jean collar. The present rayon scarves, instead of being square, are cut longer and narrower, so that the same length is obtained by a direct fold of the material.

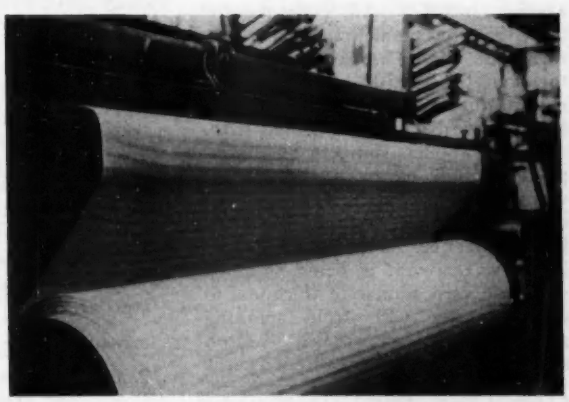
Nylon

Although continuous filament rayon and nylon yarns are similar in appearance, there is quite a lot of difference in their reactions during weaving. Where a rayon yarn will develop short fibres if roughly handled, e.g., a rough heald wire or a rough shuttle, a nylon yarn will split and felter until a hopeless tangle results. Similarly damaged rayon yarn will often weave safely through the reed without endangering adjacent threads, or the end will snap if sufficiently frayed, but the nylon yarn may do a lot of damage before breaking, and all adjacent threads that have had their fibres disturbed by the split end will have to be cut out and pieced with fresh yarn—the frayed ends cannot be woven through the reed without spoiling a lot of cloth and causing trouble. There is a liveliness, too, in nylon yarns which creates in weft a tendency to fly to anything of a metallic nature, especially if extra twist is put into the yarn. One effect of added twist in nylon yarn can best be illustrated by describing two plain fabrics. A *parachute fabric* may be made in a plain weave, 100 ends and picks/in. of 45 den. nylon with 7½ turns/in. A nylon *chiffon*, also a plain weave, may have 100 ends and picks/in. of 45 den. nylon with 30 turns/in. These are identical cloths except for the turns per in. in the yarn, the extra turns making the *chiffon* into a transparent fabric, yet a split warp thread might weave through safely on a parachute fabric whereas it would fly across a number of others in the chiffon, cutting them like the old-time grocer used to cut string by a taut cord of the same material. This cross-cutting of warp threads by split nylon fibre only occurs on plain weave fabrics, the cut taking place where the two sheds are crossing behind the healds, the split fibre lying like a fine wire across the warp ends. It does not occur in a twill fabric, where the threads never cross each other end-and-end. Another point with nylon yarn is the accumulation of size that tends to choke the reed wires, chiefly at the sides of the fabric. This is especially true of parachute cloths, where temples cannot be used, and it is sometimes necessary to have the reed cleaned at the end of a piece to ensure trouble-free weaving for the next.

Nylon *voiles* and *ninons*, plain, shadow or with fancy dobby effects, are used as foundation garments, blouses, lingerie and evening dresses. Cocktail frocks, evening dresses and coats are made from nylon *embossed* fabrics, lamé striped *organzas*, double-woven bubble *cloqués* and irridescent *chiffons*. Indeed, most silk fabrics can be imitated in nylon—satins, velvets, marquisettes, taffetas, poults, coutils, brochés, etc. Blended with wool, nylon staple is used for overcoatings, suitings, dresss fabrics, shirtings and gaberdines; industrial fabrics also are included in the nylon range, including filter cloths, sifting or bolting fabrics, seed and fruit crushing material, boiler suits and overalls, laundry bags, press cloths and calender sheetings. There are nylon carpets, hammocks, fishing nets, body armour, frogmen's suits, belting, spindle bands, tapes, webbings, ropes and cords.

"Terylene"

"Terylene" is a synthetic fibre that was discovered during the last war, and has since been developed and improved until it is now taking its rightful place along with rayon and nylon. A valuable addition to the range of materials available to the textile trade, this new polyester fibre is manufactured in two distinct forms: (*a*) filament yarn that greatly resembles nylon or silk, and (*b*) staple fibre which has a wool-like appearance and is processed on the worsted, woollen, cotton and other systems. "Terylene" is suitable for most fabrics, including dress goods, clothing, furnishings and an ever widening range of industrial fabrics. Fabrics made of "Terylene" are strong and hardwearing, warm to the touch, mothproof and crease-resisting; they also have great resistance to weather and sunlight, are easily washed and quickly dried, and seldom require ironing. Woven dress fabrics include voiles, taffetas, poults, satins, brocades and velvets; industrial types include filter cloths, anode bags, boat covers, tarpaulins, protective clothing, press cloths for the oil seed industry, laundry bags and sheetings. A laundry bag of "Terylene" will stand up to 200 washes compared with the 90 washes that is the normal life of a cotton bag. The fibre has a very high strength and tenacity, wet or dry, a high resistance to stretching and abrasion, outstanding heat resistancei mmunity from attack by mildew, moth or bacteria, excellent dielectric properties and outstanding resistance to acids and oxidising agents.



Nylon and rayon mixture fabrics

Striking Progress in the Manufacture of Tufted Carpeting

Details of the fibres and yarns employed, needle spacing, stitches and pile height, widths of machines and production rates, also methods of forming the pattern, including wave-lining, different heights of pile and printing

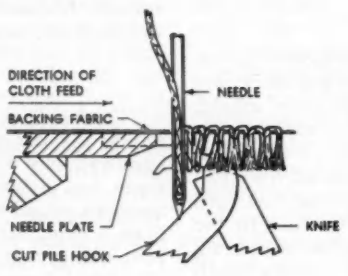
By P. ELLIS, B.Sc., A.T.I.*

THE making of tufted materials has progressed from a hand tufting routine to the present day high speed methods. As early as 1900 small concerns in Dalton, Georgia, were selling hand-tufted beadspreads, and between 1930 and 1935, machinery converted a country handicraft into a mass produced machine-made product. In recent times in America more than 50 million sq. yds. per year, i.e. half the total carpeting sold, was made on the tufting principle. In Britain more and more tufted carpeting is being sold although the trend is not as marked as in America.

Fibres and Yarns

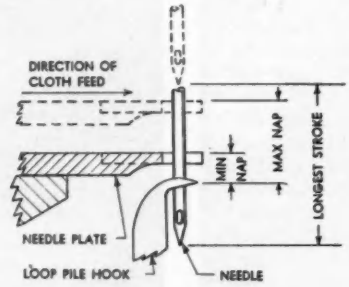
There is no reason why any normal textile fibre should not be used for tufted yarns, but the tufted trend appears to have been towards man-made fibres, and rayon staple in particular has been used extensively in this country. If, however, higher quality tufted carpet was demanded by the public, then wool, nylon and other fibres in the higher price range could be used. Tufted carpet manufacturers, however, appear to be concentrating at present on selling a product which can be purchased by people with an average income, and consequently, there is a preponderance of viscose rayon pile. Nylon has been blended up to about 5% or 10% by some yarn manufacturers and other mixture blends have been experimented with.

Heavy woollen spinners have supplied the bulk of the Axminster pile yarns to carpet manufacturers, and this will no doubt continue to be the future practice. The tufted carpet industry, however, is being supplied with pile yarn similar in thickness to an Axminster yarn from spinning systems other than woollen. Cotton spinners produce single or folded yarns



CUT PILE MACHINE
Fig. 1

of about 1s cotton count or its equivalent, and the jute spinners are producing yarns for tufting. The main essentials for a tufted yarn are long lengths without knots and cleared of thick places, wound on to large conical packages for over-end creel feeds to the machine. Spinners, too, will probably be asked to supply large amounts of the same lot of yarn since some creels for the largest machine have a full creel yarn weight of about 10,000 lbs. of one colour. It would appear then, that the tufted carpet industry has yarn requirements not all needed in traditional Axminster carpet manufacture: (*a*) large conical creel package; (*b*) knotless and cleared yarn; (*c*) comparatively large weights of one lot.



LOOP PILE TUFTING MACHINE
Fig. 2

Pile Yarn Delivery and Fabric Take-Up

Weft insertion, shedding and beat-up mechanisms of the traditional loom are eliminated and herein lies one main reason for the high speed of the machine. Fabric take-up mechanism and the arrangements for feeding in the pile yarn, however, correspond in a sense to the traditional take-up and let-off on the loom. The machine has a fixed number of speeds for the cloth take-up roller; usually up to about 6. Changing is accomplished on most machines simply by moving a small lever into one of the retaining positions. The gearing for the take-up roller drive is concealed and there are no change wheels as on traditional looms. Practical limits for rows per in.—or stitches per in. as they are usually called—on tufting machines is 4 to 14. Most carpets are now tufted at about 7 to 8 stitches/in. The speed of the take-up roller governs the number of stitches per in. as on the traditional loom.

Pile yarn delivery is from large cones which may be magazined. Cobble Brothers make a creel for their machine which accommodates 10 ins. dia. cones of about 8 lbs. with a conicity of 15°. Generally speaking pile yarn counts are as for Axminster carpets, about 2/50s Dewsbury carpet yarn count or 2/2s cotton; some single 1s cotton count is used. The yarn is usually carried from the creel in tubing about ¼ in. dia. and a colour/letter/number reference system is used relating creel position with loom needle position. The yarn, blown from creel to loom by compressed air, is taken from the creel by a yarn feed roller fitted on the machine above the needles, and these prevent the formed loop from being pulled shorter at subsequent needle insertions when the hook has released the loops. In practice a tighter stitch can be made if the

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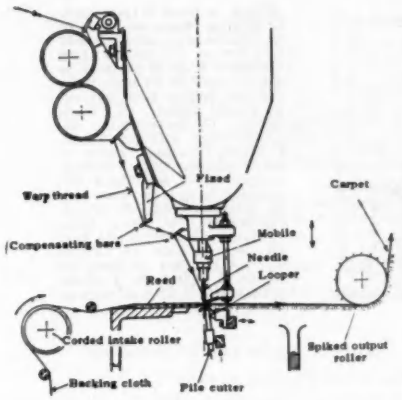


Fig. 3. Schematic layout of tufting process (courtesy, British Tufting Machinery Co.)

yarn is underfed so that the needles tend to extend it by about $\frac{1}{16}$ in. loop height. A yarn compensating device (Fig. 3) fitted between needles and feed rolls, slackens or tightens the yarn as required during tufting.

Needle Spacing and Stitches

The distance between the needles transversely across the machine which is the distance between lines of tufts, is known as the gauge. Common examples are $\frac{3}{16}$ in. and $\frac{5}{32}$ in. which correspond to $5\frac{1}{3} + 6\frac{2}{5}$ Axminster pitch. Recently $\frac{1}{8}$ in. gauge has been introduced. The gauge can be changed only as a major and expensive operation, although, halving the gauge say from $\frac{5}{32}$ in. to $\frac{5}{16}$ in. is a much simpler matter of removing every other needle. Stitches per in. is the equivalent specification as rows per in. in the traditional carpet and the figure is one of the several variable quality factors. An average figure is 8 stitches per in. and with $\frac{5}{32}$ in. and $\frac{3}{16}$ in. gauges these produce 51 and 43 tufts/sq. in. respectively. The range of stitches/in. is about 4 to 14.

Pile Height

This is governed by the distance from the backing cloth to the hooks which retain the pile yarn after needle insertion. An increase in pile height can be made by raising the level of the fabric at the needles by a "shim" or additional plate fitted to the needle-plate on which the backing fabric rests. This needle-plate is equivalent to the traditional breast plate on the loom. The number of "shims" which can be used is limited and beyond this a new set of eccentrics which control the needle stroke, must be fitted. It is usually possible to raise the pile height about $\frac{3}{16}$ in. above the minimum and still allow the needles to rise out of the cloth.

Various sets of eccentrics are made to give an increase in needle stroke enabling high pile to be made. Some may feel that a set of eccentrics for high pile will suffice for all pile heights but, in practice, bad pile formation and stitching can occur if low pile is made with such a set. These faults are due to excess yarn on the back side of the fabric caused by the needle rising too far out of the cloth. In Table 1, Cobble Brothers give the needle strokes available and the pile height which is possible from them.

Table 1

Stroke (ins.)	Inches	Sixteenths
1	$\frac{1}{4}$ - $\frac{1}{4}$	2 - 4
$1\frac{1}{16}$	$\frac{5}{16}$ - $\frac{1}{4}$	3 - 4
$1\frac{1}{8}$	$\frac{3}{8}$ - $\frac{5}{16}$	4 - 5
$1\frac{1}{16}$	$\frac{3}{8}$ - $\frac{3}{8}$	4 - 6
$1\frac{1}{4}$	$\frac{7}{16}$ - $\frac{5}{16}$	5 - 7
$1\frac{1}{8}$	$\frac{7}{16}$ - $\frac{1}{4}$	5 - 8
$1\frac{1}{2}$	$\frac{7}{16}$ - $\frac{1}{8}$	7 - 10
$1\frac{1}{8}$	$\frac{7}{16}$ - $\frac{1}{4}$	9 - 12
$1\frac{1}{2}$	$\frac{11}{16}$ - $\frac{1}{4}$	11 - 14

A smaller stroke of $\frac{7}{8}$ in. is fitted to bedspread machines. N.B.—If a change of pile height is made then it is obviously necessary to adjust accordingly the rate at which the pile yarn is fed in by the feed rolls.

Cut Pile and Loop Pile

The hooks on the loop pile machine (Fig. 2) engage with the yarn just above the needle eye after full needle insertion is made. The point of the hook faces and moves towards the carpet which has been tufted, i.e. away from the creel. Subsequently, after the hook has moved towards the yarn and retained the loop, the needle is fully withdrawn; the hook then moves backwards leaving completely the formed loop. The cloth moves away for 1 stitch length after this action and the cycle commences again. There is, of course, a need for the most careful timing and setting of hooks and needles. Cut pile (Fig. 1) is made by the same sort of action except that the hooks face the opposite direction and thus, the loops run on to the hooks and are released by being cut. Usually, three loops lie on the hook, the one farthest along the hook being cut by the knife. In addition to careful timing and setting of the mechanism there is a need for a precise fitting for this knife blade and the cutting surface of the hook if the correct shearing action is to take place.

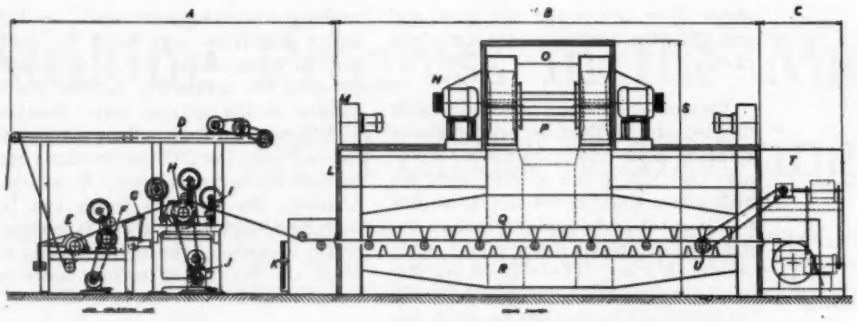
Width of Machine

One firm makes widths of 30, 61, 120, 162 and 202 ins., the smallest width being intended for sample making or development work, so that larger machines may carry on with normal production. It can, of course, be used for producing narrow width fabrics in the normal way. Smaller widths can be tufted on these machines, for example, the 202 ins. machine can be used for tufting 12 and 9 ft. widths. Usually, the standard width can be increased slightly as there is enough width of opening through the head to allow the number of tufting units to be increased.

If pre-shrunk backing is not used then due allowance must be made for shrinkage of about 3 to 10% depending upon the finishing processes and the weight of the backing; lighter weight backing shrinks more. If a machine alternates between using pre-shrunk and shrinkable backing, then it would be preferable if the machine width were made up to the next standard width above that of the shrunken finished width. It is possible to produce two or more narrow widths simultaneously on the same machine and a needle may be left out to form selvedges, or separate backing rolls could be used. In the former case, a cutting blade could be fitted on the machine or the piece could be cut after finishing. When running more than one width, it is possible to have equal or varied widths. If patterned rugs are being made, however, the lengths of rugs for different widths would have to be the same. Some seaming of narrow widths is done but it seems reasonable to say that just as in traditional carpet manufacture broadloom is preferred to seamed carpet, so it will be in the sale of tufted carpets. Lastly, mention must be made of miniature tufting devices with a smaller number of needles in the width. A 30-needle machine is made by one firm who also market a single needle machine which is virtually a type of sewing machine. These machines are particularly useful for sample and development work.

Production Rates

Actual production rate of a fabric producing machine depends upon many factors varying from one firm to another. The production rate at 100% machine efficiency is set out in Table 2 and should be adjusted accordingly. The comparison is for tufted carpets 8 stitches/in. and medium quality Axminster produced on wide and narrow looms. The spool Axminster loom, is of course, unlimited in its scope for producing attractive colour designs, and this must be borne in mind when comparing its



A, 16 ft. to front of latex unit. B, Drying chamber. C, 6 ft. D, Overhead framework only required when drying chamber is dual purpose to allow fabric to by-pass latex unit for drying after dyeing. E, Brake roller. F, Back brush. G, Steam box. H, Latex roller. I, Doctor blade. J, Variable speed drive to latex roller. K, Floating roller. L, 2 ins. thick insulation to drying chamber. M, Exhaust fans. N, Dryer fan motors. O, Dryer fans. P, Heating batteries. Q, Hot air jets to pile of fabric. R, Hot air jets to back of fabric. S, 13 ft. high. T, Main drive unit. U, Driven carrier rollers

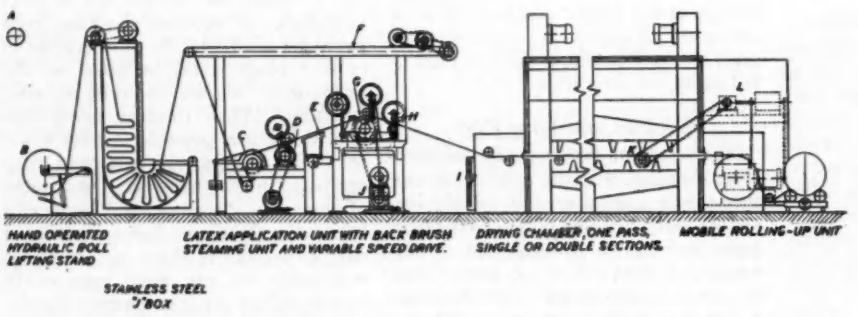
Fig. 4. Layout for tufted carpet steaming, latex spreading and drying (dual purpose) (courtesy, Sellers and Co. (Huddersfield) Ltd.)

Table 2
Tufted and Axminster Production Rates at 100% Efficiency

Type of Machine	Machine speed	Linear yds./hr.	Sq. yds./hr.	No. of times as productive as narrow spool Ax. loom at 100% E.
Tufted 202 ins. ..	550 stitches/min.	115	45	124
Tufted 61 to 120 ins.	720 stitches/min.	150	255 - 500	49 to 96
Spool Ax. wide loom 7 rows/in. 14/4 split shot, single insertion	14 rows/min.	3·3	11·7	2·2
Spool Ax. narrow loom 7 rows/in. 3/4 split shot, single insertion	29 rows/min.	6·9	5·2	1

simple hand-held automatic device inserts tufts at the required intervals down the carpet and these are then trimmed to the correct height.

Stainless steel "J" boxes can be used to store the fabric between operations and the material may be wet or dry. The fabric is fed forward by spiked draw rollers running in ball races


HAND OPERATED HYDRAULIC ROLL LIFTING STAND
LATEX APPLICATION UNIT WITH BACK BRUSH STEAMING UNIT AND VARIABLE SPEED DRIVE.
DRYING CHAMBER, ONE PASS, SINGLE OR DOUBLE SECTIONS.
MOBILE ROLLING-UP UNIT
STAINLESS STEEL J-BOX

A, Carpet leaving beating machine. B, Roll of dyed and dried carpet. C, Brake roller. D, Back brush. E, Steam box. F, Overhead framework only required when drying chamber is dual purpose to allow fabric to by-pass latex unit for drying after dyeing. G, Latex roller. H, Doctor blade. I, Floating roller. J, Variable speed drive to latex roller. K, Driven carrier rollers. L, Main drive unit

Fig. 5. Layout of tufted carpet finishing range when the same chamber is made for both drying after dyeing and then used for curing after latex application; made in any width from 60 ins. to 240 ins. (Sellers and Co. (Huddersfield) Ltd.)

lower production rate with that of the tufted machine. Tufted carpet can, however, be made with some designs and this matter is discussed later. Furthermore, in the above comparison it must be appreciated that loom efficiency is usually high in spool Axminster weaving. For the year ended November, 1956, the U.K. totals for the production of tufted and traditional carpeting are set out in Table 3.

Table 3
Amount of Tufted and Traditional Carpeting Produced*

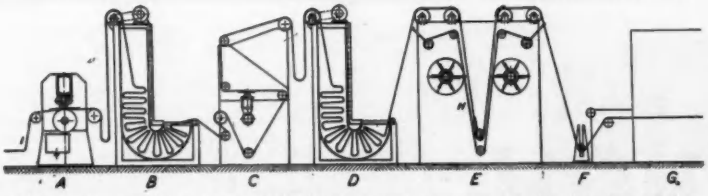
Spool Axminster	17·0 - 36%
Gripper Axminster	9·6 - 20%
Chenille Axminster ..	2·2 - 5%
All Types of Wilton ..	8·4 - 18%
Others	4·0 - 8%
Tufted	6·0 - 13%

* For the year ending November, 1956. U.K. totals in millions of sq. yds.

Finishing Routine

Carpet which is not piece-dyed is subjected to the following sequence of processing: (*a*) mending, (*b*) steaming, (*c*) latex spreading, (*d*) latex drying and curing, (*e*) shearing, and (*f*) measuring, inspection and cutting (Figs. 4, 5, 6 and 7). Rolling up of the carpet can occur again after mending, drying, shearing, inspection and cutting; if the carpet is piece-dyed, this process precedes steaming and latex spreading. The dyed piece can be dried by full width squeezing and vacuum extraction followed by hot air drying. A dual purpose dryer is made for use after dyeing and latex curing. Mending of the carpet (Fig. 8) usually consists of inserting the tufts missed out down the length of the carpet in the space normally filled by the yarn from a needle. Mending is carried out on the back of the machine, usually whilst tufting continues. A together with a geared motor drive. The piece dyeing of carpets is not usually carried out in traditional manufacture and, therefore, the pile is not flattened by wet processing. For tufted carpets the piece dyeing extraction and squeezing can make it necessary to install a carpet beater to restore the flattened pile to normal height; in some yarns lack of fibre resiliency makes this process necessary.

Because of the method of tuft insertion, tufted carpet has to be backed with a most efficient adhesive such as a latex compound. Traditional carpet holds the tufts comparatively firmly, because of its woven structure, and the usual backsizing materials are natural sizes. In the former, the cost of back-sizing is high, but the advantages gained are excellent tuft



A, Full width squeezing. B, Stainless steel "J" box. C, Full width vacuum extraction. D, Stainless steel "J" box. E, Full width double beating. F, Light weight "floating roller". G, Drying chamber. H, Blanket under tension. I, Wet pieces from dyeing machine

Fig. 6. Layout of tufted carpet finishing range (when separate chamber is used for drying after dyeing). Made in any width from 60 ins. to 240 ins. (Sellers and Co., (Huddersfield) Ltd.)

anchorage, marked stiffness and the ability to cut the carpet for fitting in any direction without fraying.

Methods of Forming Pattern

The three ways of making patterned effects in tufted carpets at present, are:—

(1) Wavelining
(2) Making different heights of pile
(3) Printing.

The first method consists of simply reciprocating the carpet sideways as it is woven. The device which moves the mounting for the needles to and fro is simple in construction and occupies little space at the side of the machine. By suitably threading two or more different colours of yarn in the needle across the full width, a most attractive effect can be obtained. The further use of yarns which have other shades printed, or their natural shade left upon them, for short lengths, considerably add to the effect.

One machinery maker offers a universal type of pattern attachment for widths up to 120 ins., a single and dual end scroll type pattern attachment for widths 120 to 202 ins., and a geometric pattern attachment. The pattern is formed in each case by a pattern drum mounted at the rear of the machine. The pattern is set forth on the drum by annular milled grooves in which the pattern control fingers move. When a finger drops into a groove it closes an electrical circuit and switches its respective yarn guide finger into high pile position. When it rides up out of the groove it breaks the circuit and low pile is made by the returned finger.

The universal type pattern attachment has a pair of feed rollers wrapped with emery strips $\frac{3}{16}$ in. wide. The strips do not have the same position on the rolls but alternate at the front and back rolls, which have a speed ratio of about 2 to 1. Immediately above the two rolls are yarn guides, each holding two threads which lead to two adjacent needles. Each guide is controlled by a solenoid that normally aligns the two threads with the emery

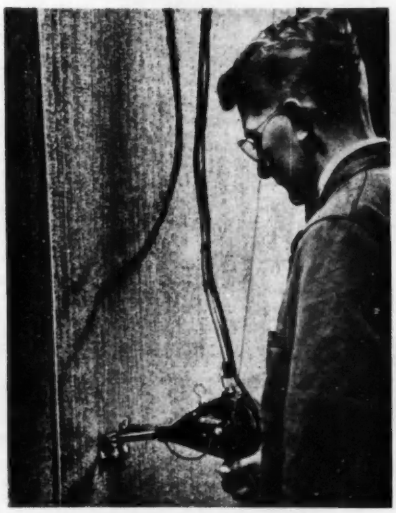


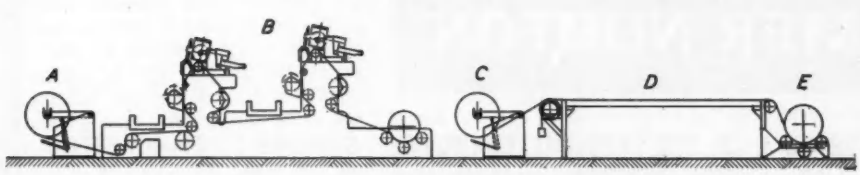
Fig. 8. Replacing missing tufts

strip on the slow speed roll, allowing them to be driven by this roll, and to slip on the smooth strip of the high speed roll. These two threads are then formed into a low pile height. High pile height when called for, is formed by moving the guide fingers over laterally to align the threads with the emery strip on the high speed roll; the solenoid controlling the yarn guide finger is energised to accomplish this. High pile is formed when the finger drops into a groove.

Unlimited designs of any width are possible up to the full width of the machine and a change of drum is all that is needed to change the pattern. Repeats of a design could be cut on the one drum if small width rugs are to be produced across the full width. The theoretical production rate of the machine need not be reduced when this attachment is fitted.

The single end scroll type of pattern attachment consists of a series of yarn feed rolls that can be driven at two different yarn delivery speeds in the ratio of about 2 to 1. A group of yarn feed tubes are placed to carry the yarn from each roll to the respective positions along the machine width; each tube contains a single yarn for feeding one needle in the repeat. The repeat of the pattern is determined by dividing the number of yarn feed rolls in the device into the number of needles contained in the machine, and usually the width of the repeat is about 18 ins. The speed of each roll is selectively controlled by a pattern drum similarly to the other pattern attachments, a slow yarn delivery speed producing low pile and the high speed giving an increase in pile height. Non-symmetrical and patterns that contain curves can be made. The fitting of this attachment does not affect the theoretical production rate. A dual end scroll type pattern attachment (Fig. 10) is also made but each tube contains two yarns for feeding adjacent needles in a given repeat.

The geometric pattern attachment can be made for any size of short loop machine (Fig. 9). The device consists of a number of controlled rolls, usually between 4 and 9, which can be run at two speeds and the pile threads are threaded in a pre-determined sequence. The speed of the rolls can be controlled by pattern chain or drum, and both methods selectively govern the



A, Hand-operated roll lifting stand. B, Double cylinder shearing machine with back and face brushes and rolling up unit. C, Hand-operated roll lifting stand. D, Measuring and inspecting table with cutters for cutting to warehouse lengths. E, Rolling-up stand for final warehouse lengths

Fig. 7. Layout of carpet finishing range. Made in any width from 60 ins. to 246 ins. (Sellers and Co. (Huddersfield) Ltd.)

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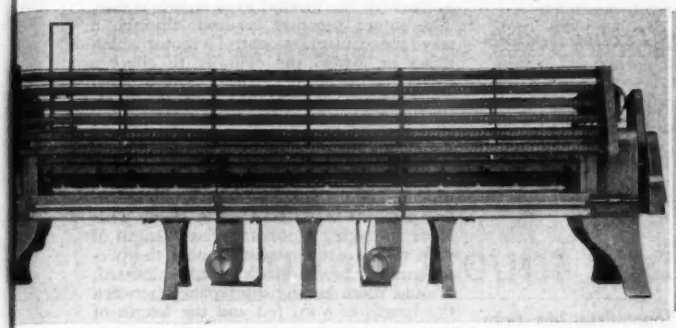
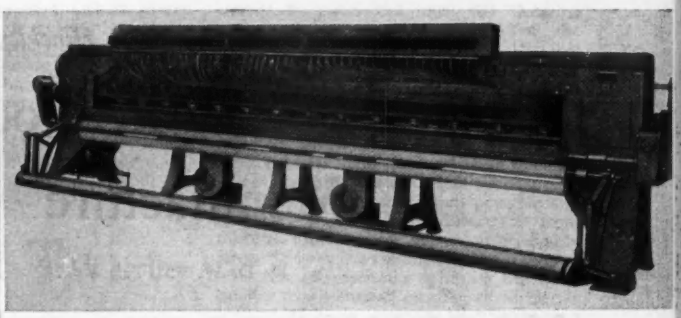


Model E.C.B. 5,000 202-in. broadloom tufting machine equipped with 6 roll geometric pattern attachment. (Cobble Bros.)



Model E.C.B. 5,000 202-in. machine equipped with an automatic cloth cradle a dual and scroll-type pattern attachment. (Cobble Bros.)

amount of yarn fed to the needles. A great variety of geometric patterns can be made, including random textures. The machine theoretical production rate is not reduced by the attachment, and the rolls may also be fitted with a four-speed drive if needed.

Cobble Brothers recently announced that cut or loop pile can be produced now on one needle using cut pile hook only. Striking effects can be obtained by forming high cut and low uncut pile. The height of the various portions of cut or loop can be altered to the point of each being approximately the same height. This new-loop-cut attachment can be used most effectively on the universal type pattern attachment. A simple explanation of the device is that a loop stripper finger pushes the loop off the hook before it is cut if the pattern calls for loop pile.

The most recent method of producing patterns on tufted carpets is by using roller printing. British Tufted Machinery Ltd. have produced a unit for printing tufted carpeting up to 12 ft. wide at 16 yds./min.

In conclusion, mention must be made of two machines which may offer some competition to normal tufting machines. The first is made by Crabtree's, Bradford, and the other by Radcliffe Engineering Co., Lancs. Their theoretical rate of production is less than normal tufting machines and their method of tuft forming is somewhat different. The Crabtree needle Axminster loom has no weft insertion but the needles push through the hessian a cotton binding warp which has the individual pile threads threaded through the cotton loops formed by the needles. The cotton warp then pulls tight on the yarn, the tuft is cut away and the row of pile is anchored firmly to the hessian, the tufts lying weft and not warp ways. The Radcliffe machine anchors the tufts in P.V.C. (or some other suitable material). This machine, it is claimed, can deal with yarn that is uncleared and contains knots. The yarn can be fed from a beam and is wrapped over thin bars lying evenly spaced across the width—rather like the wires on the traditional Wilton loom.

Precautions Against Fires from Friction

EVERY year fire brigades attend over 1,000 fires caused by friction of one form or another. About two-thirds of these fires are attributed to over-heating of bearings and other parts of machines and the remainder to sparks from frictional impact or abrasion. About half the total of outbreaks occur in buildings and in an average year fires in the textile industry account for a large percentage of these.

The Fire Protection Association, 31 - 45 Gresham Street, London, E.C.2, has now produced a technical information sheet (No. 5004) on the subject entitled "Friction (Mechanical Heat and Sparks)" The range of sources of friction is considerable. The cause of over-heating of bearings is to be found in a variety of conditions in which associated shafts, belts and other transmission units may play a part. The spread of fire originating in bearing friction is often aggravated by the oil which may cover the surrounding surfaces. Among causes of excessive friction in bearings are:—

(1) "Brasses" of plain bearings too tightly fitted, thus providing insufficient clearance for lubrication or latitude for journal distortion. Heating may also be caused by high spots left by defective "bedding-in."

(2) Lack of lubrication due to inattention to the oil level, proper rotation of the oil rings, leakage or blocked oil-ways. The "idler" guide pulley bearings of conveyor belts, which may be carrying combustible material, often suffer from lack of lubrication as a consequence of their being difficult of access.

There is a risk in applying oil to overheated bearings in attempts to keep the machinery running. Considerable discretion is required to decide when, with probable seizure as the alternative, deficient oiling may be rectified without stopping the shaft and allowing the bearing to cool.

Overloading may be brought about by a number of circumstances. Friction and consequent heating may be caused by bent shafts or shafts coupled together out of alignment, or unsuitable, ineptly arranged or badly adjusted belting.

Torsional overloading, as distinct from excessive weight carried by the shaft, is the least likely to cause trouble.

Belts

Excessive friction in bearings associated with belt drives is often caused by undue tension. This in turn may be brought about by a variety of factors. Predominant among them are: a load beyond the normal capacity of the belt and, with flat belts, pulleys at centres too closely spaced, or a pulley-diameter-ratio too great to afford a good "wrap-round" or "arc of embrace" of the smaller pulley.

The latter condition may be aggravated by the belt driving on the top arcs of the pulleys, thus further reducing the "wrap-round" and necessitating increased belt tension. In the case of short-centre drives and those in which the pulley-diameter-ratio is considerable an improvement may be effected by recourse to a "jockey," or "idler," pulley, applied to the slack side of the belt so as to increase the arc of embrace.

Another accidental cause of excessive belt tension is the use of flanged pulleys, which are sometimes resorted to to prevent the belt slipping off the pulleys in drives where heavy starting loads or temporary overloads may occur. The tendency of the belt, when slipping occurs, is to "ride" the flanges, which should therefore be sufficiently deep to prevent this.

Excessive friction in belts can be the cause of fires. Usually sufficient friction to cause ignition is only brought about by the jamming of a belt while the pulley continues to revolve and this may occur even with V-belt drives if the load is excessive or the adjustment defective.

Hinckley Textile Society

New Trends in Stocking Manufacture

By D. W. SMITH, A.T.I.†

MOST of the new methods used in stocking manufacture are devoted to cheapening the product without lowering the quality. Some of these can be considered under the heading of automation, others are new ways of rearranging processes to cut labour costs and reduce handling.

The "Smithknit" technique of passing yarns over a heater on the way to the feeder of a seamless hose machine is a British development which provides an effective way of knitting a good looking welt with excellent extension properties from unprocessed yarns. Up to now this has not been satisfactorily done—the large stitch size required in a seamless hose welt has always resulted in bad fabric appearance unless yarns processed by specialised methods have been used. If, in addition to the use of the heater, the conventional 40 and 45 den. yarns are replaced by the new coarse filament yarns—40/6/$\frac{1}{2}$ and 50/10/$\frac{1}{2}$—snagging damages caused by handling are very much reduced.

The theory behind the operation of this device is now thought to be not as simple as at first imagined but we are more interested in the fact that it works, rather than how it works. Most important from our point of view is to warn users of the dangers of leaving yarns on the heater and using heaters too hot. To measure the temperature of a metal surface is more difficult than appears, but it is essential that a correct measure of the temperature be obtained and that the temperature of the hottest point of the heater should not exceed that recommended by the suppliers of the equipment. Yarns which lie on the heater during machine stoppages must be pulled through before the machine is allowed to start knitting.

In the field of full fashioned hosiery there is a world-wide trend towards allocation of two multihead machines to one operative. Outside Britain these are not always fully automatic. This is often explained by the fact that the reduced pressure of demand for fashioned stockings makes the production per man more important than the production per machine and spare machine capacity is often available to permit its being used at less than full efficiency. This change in method of working which doubles the number of yarn packages supervised by each operative increases the value of large packages of yarn which need less frequent replenishment.

After leaving the knitting machine the production of fashioned hose has been speeded considerably by the flow system of seaming and examining. In some cases, the output of seaming operatives has been more than doubled. By placing the seamer's supply of hose in a long tray just below her right arm, and putting a bin on her left into which the seamed hose fall with the connecting chain still intact, much of the handling of the goods is avoided. The same connected string of hose is pulled from the bin by the examiner and a "mousetrap" arrangement on the examining form holds the next hose in place while the connecting chain is automatically cut. Examining machines which turn the stocking to its right side while ejecting it into a dye bag, complete the mechanisation of this part of the process.

Length Control

Two new methods used for seamless hose knitting can be considered within the field of process mechanisation. These are the removal of long ends of yarn left by the machine at yarn changes by a cutter on the knitting machine, and the automatic control of stocking leg lengths.

A large number of "end cutters" are being installed in the U.S.A. An attachment to the dial of the knitting machine carries the ends of yarn from the feed point round to the front of the machines where they are cut close to the fabric leaving an end of only about $\frac{1}{4}$ in. in length. It is claimed that the main benefits obtained from this attachment follow the removal of scissors and other cutting implements from the hands of the examiners. In addition to the saving of time spent in trimming there is the elimination of the very real risk of damage to the hose by lack of care in trimming.

There are three versions of this type of cutter on the American market. One is sold by Gordon Industries—a subsidiary of Hanes, the large American seamless hose manufacturers who have installed this device on their machines. A similar one will shortly be available from Scott and Williams, the machine builders. A rather different principle is used by the manufacturers of the Fidelity seamless machine where an electrically heated wire forms a cutting element instead of the scissor action used by the other two.

There have been many attempts at devices to control stocking leg lengths on seamless machines. These have been effective to very varying degrees and most have tackled the problem by controlling the ingoing yarn tension. One of the first devices which moved away from yarn tension control was another development of Hanes in the U.S.A. for use on their own machines. It has now been redeveloped and made generally available by Scott and Williams. This controls fabric quality by indirectly measuring loop size. This is done by sensing the pressure exerted by the knitted loop on the sinker. The sinker pressure is used, through a servo mechanism, to control a motor which raises or lowers the cylinder to effect a correction in fabric quality. The original servo system was wholly electrically operated while the Scott and Williams' version is pneumatic/hydraulic.

The latest length control method is positive yarn feed as developed by H.A.T.R.A. in this country and by the Moretta seamless machine manufacturers in Italy. This feeds through nip rollers a fixed length of yarn to the needles so that only the predetermined fabric quality can be knitted. Should there be any discrepancy between the length of yarn fed and the length of yarn knitted, the machines will cease to knit because of yarn breakage. Although this appears to be an ideal method for positive control, one is bound to be a little suspicious of its behaviour on older machines where cylinders may stick during ankle graduation and lead to the situation where more yarn is being knitted than fed in with consequent pressing off. As neither of these has yet been installed in large numbers, particularly as accessories on older machines, their efficiency remains to be seen. It is interesting that the method of control on the Moretta machine is now being modified into a less positive system than the one at present on their production machines.

In dealing with cheaper methods of toe closure for seamless hose, it is necessary to look at the different trading conditions in U.S.A. and Britain. Although the Getaz toe was patented in the U.S.A., it is not as successful there as it is here. Whereas in this country this style is generally accepted as being equal to a linked toe—partly because of its resemblance to a fully fashioned toe when finished—in the U.S.A. the buyers have been quick to realise the lower production cost and to insist on a lower price for these goods. Consequently, where linking operatives can be found and trained, it is generally in the manufacturers' interest to continue with linking.

The new A.M.S.L. linking attachment which can double the linking speed of an operative but gives a more bulky seam, is viewed in the same way and its use only foreseen on cheaper lines.

In dyeing and finishing hose the most interesting development is the dyeboarding machine which scours, sets, dyes and gives an anti-snag finish to stockings while on metal formers in a pressurised chamber. The reduction in labour costs and damages associated with many handling operations is obvious but there are, at the same time, complications of the control mechanism of such a machine to ensure adequate batch-to-batch uniformity of the dyed product. Development is still taking place and reliability of the control system is continually being improved. About 30 German built Colorplast machines are now in production and are reputed to be giving satisfactory results. The new dyeboarding machine produced by the Turbo Machine Company of U.S.A. is smaller and more compact and works on the same principle.

It is clear that to make the best use of a machine of this type, standardisation of production is required to as few lines as possible, because in addition to the changes needed to obtain different shades and to deal with different sizes of hose, a change in the constituent yarns of a stocking needs a variation in the temperature and time variables of the dyeing cycle to obtain solid

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* *From a paper given recently to Hinckley Textile Society.*

† *British Nylon Spinners Ltd.*

shades between the panel and the welt. A machine of this sort gives best results where the hose are a good fit on the formers. This tends to give the vertically organised manufacturers who finish their own products, advantages over commission dyers who receive a wide variety of goods and have little control over their quality.

Apart from the present fashion trend from fashioned to seamless hose, the finished stocking shows little change, at least to the wearer. As we have seen there are, however, many changes taking place in the yarns, the machinery and the methods used in their manufacture. It is essential that the manufacturers of this country should take full note of these changes.

Controlling Count and Twist in Woollen Yarns*

CONTROL of count and twist in woollen yarns was the subject of a lecture given to a recent joint meeting of the Dewsbury and Batley Textile Societies. Experiences of an increasing number of firms who are adopting part, if not all, of a practical scheme for the control of twist and count of woollen yarn were mentioned by Mr. R. T. D. Richards (Wool Industries Research Association) and details of one particular firm's type of control scheme were given by Messrs. P. R. W. Ducker and F. Percival (Wormalds and Walker Ltd., Dewsbury). It is felt that a great deal of beneficial information is gained from this simple and direct scheme of testing.

Ideally, all slubbings across the width of the carding machine should have the same count. The control of yarn count is achieved by frequent tests at the carding condenser. That is, it is accepted that variation in yarn count is governed primarily by the variation in slubbing count when the spinning machines are functioning satisfactorily. The extreme counts of slubbing ends can differ by as much as a third of the average count of all ends. The aim should be to achieve a difference of an eighth or less of the average count.

If possible, carding machines should be tested for variation across at least once a fortnight, but for the same blend the main details of the pattern will persist for a longer period. Attention to faulty rings, uneven tape tension and layering of the Scotch feed sliver has enabled one firm to reduce this difference, averaged over all the machines, from a fifth to about an eighth. For a series tape condenser, the bobbin weights can be altered according to the total weight of slubbing on each bobbin. When there are two bobbins at each height, some firms merely weigh the slubbings on the condenser bobbins as an approximate check for variation between each half of the condenser.

Tests have been carried out in which every condenser bobbin produced on one machine for a period of over two days was weighed. The variation along between bobbins from the same position was considerable. The length on each condenser bobbin was estimated from the revolutions of the drum and the count was estimated from this length and the total weight. Consecutive 1 yd. lengths from condenser bobbins were also weighed, again showing considerable variation along. Both short and long term variations were therefore considerable, showing the limitations of reeling at the card. Since the estimate can be in error, any machine adjustment could possibly cause the average count to be even further off the mark. Snap estimates at the mule or frame can be even more misleading because of the aggravation caused by spinning three or more carding doffs together. It shows the danger of trying to correct this to alter the draft. It is important to adjust machine settings to reduce the variations obtained since the quality control cannot be achieved unless the process itself is controlled. Every variation revealed should be investigated and attempts should be made to reduce it as much as possible. This is particularly important at the card.

Snap checks by reeling are, however, widely carried out by foremen and spinners and so form a useful common ground for the start of a quality control system. In fact, in the initial stages, appreciable improvements in spinning can be achieved merely by setting up a single and regular reeling check, carried out by members of the testing staff. By frequent re-testing it is possible to change the yarn count to that which is required, but this method can be wasteful both of time and material. Co-operation between spinners and testing staff introduces quality control methods on the mill floor and generates interest in quality control. Frequent reeling by members of the testing staff can overcome the bugbear of spinning heavier counts than those required.

Count and Twist

An alternative method of controlling yarn count was proposed, in which the slubbing count is estimated as suggested above by weighing a known length of slubbing on a condenser bobbin. The correct spinning draft on a mule is obtained from the carriage movement and the length of slubbing delivered by the back rollers. This can be done by a small, simple device described in an article in the (Tex. Man., 1959, 357) by one of the speakers (F.P.). The use of this device has enabled the correct count of yarn to be spun from the beginning of the blend. It is essential to measure the length delivered by the back rollers as the position of the length wheel peg does not fully fix the length delivered irrespective of other changes on the mule. Preliminary trials with this method show that appreciably more level yarns are obtained. It might be useful to have a further check of varn count from the estimates of total weight and total yardage on the cops. The full application of the above method cannot be successful until the slubbing count is less variable and often the W.I.R.A./B.E.P. "Autocount" is desirable to attain this.

A survey of twists will nearly always bring to light certain discrepancies. These are usually due to different twists being inserted in the same blend by different machines. This may not only lead to faulty pieces but will almost certainly bring production below the maximum possible and increase its cost. Twist differences from mule to mule are sometimes unbelievably large. If twist is controlled by the foreman, who sets all machines spinning the same quality to a standard number of turns per inch, noticeable increases in production can be obtained. One difficulty is to determine with reasonable accuracy on the mill floor the actual turns per inch being inserted by a mule.

Two methods commonly used are counting the knots and measuring the number of turns of a spindle with a revolution counter. By using a suitable conversion factor, the figure obtained by either method can be converted to turns per inch. Unfortunately, this conversion factor is not always identical: it sometimes varies from mule to mule due to machine differences, and from quality to quality on the same mule. However, in the majority of cases the conversion factors are closely similar and for a particular quality, once the mule has been set by adequate testing of the yarn with a twist tester, it can be kept at that setting by using knots or the revolution counter. Too little emphasis has been given to twist in the past and a little extra attention may well be rewarding.

The testing staff required for about a dozen carding engines seems to comprise one senior and two junior members. There should be close co-operation between the senior member and the carding and spinning staff. Testing staff should undertake all testing, including that which must be done at the machines. Calculations should be kept to an absolute minimum and statistics should be avoided as much as possible. It is far more important for the testing staff to be actually testing or discussing the results with the processing staff than spending their time on calculations. In other words, quality control is first and foremost a practical subject and not an academic one. Most people speak in favour of quality control but in practice they do not accept it so easily. This is probably because they are not clear about what is being attempted and are afraid that it will merely show up faults, instead of helping them to overcome difficulties and benefit by improved standards of quality. Exactly what is being attempted should always be clearly explained to foreman and staff as their co-operation is vital. Managements must be convinced that quality control is necessary and be prepared to support it vigorously. Among benefits recorded are (*a*) the opportunity of checking fully new and old machinery, blends and processing methods, (*b*) fewer faults in fabrics, (*c*) considerably less waste of yarns due to incorrect overall count, excessive variability or over-production, (*d*) reduction in processing costs, particularly if yarn twists can be reduced, and (*e*) new contracts, particularly when these require finer yarns than those usually spun in the mill. The difficulties of applying such a system are considerable and can only be overcome gradually, and enthusiasm and energy are needed to keep it going.

* *From a lecture given recently to Dewsbury and Batley Textile Society.*

Compression Packings: Design and Application

Flax, cotton, jute, wool and asbestos are still extensively used for an extremely wide variety of applications. Newer materials are also now being employed, and this article discusses such points as selection of types and fitting techniques

By C. F. MOORE•

THERE are many sound technical bases for the design, construction and application of rod and sheet type compression packings, but these principles are frequently overlooked by users. The result is improper application of many of the compression packings available. A number of packing materials—flax, jute, cotton and asbestos—some of which were used a hundred years ago are still being recommended for a variety of packing applications. A newer material, Teflon, is being called upon to solve many of industry's new sealing problems. Flax and jute are recommended for water applictions due to their absorptive characteristics. Cotton, because it is soft and pliable, is used to minimise the danger of scoring the shafts it contacts. Asbestos, being a mineral rather than a vegetable product, is resistant to the many acids and alkalis industry handles today.

Materials are one thing but a second consideration is the type of construction and how each packing fits a specific condition. Twists, plaits and braids of rod seal packings have been familiar to generations of maintenance men, but not so familiar are the whys and wherefores of the choices these constructions necessitate. Twist, the basic construction, is recommended for a broad range of small diameter shafts and rods and it can be easily unravelled by the mechanic to adjust its cross-section to the size of gland. Plait construction has the advantage of being soft and pliable. This makes it relatively insensitive to the compression created by adjustment of the gland ring. This lack of sensitivity is especially desirable when the plaited packing is used on a rotating shaft because it minimises the danger of excessive pressure of the packing on the shaft. A rotating motion does not dissipate heat as easily as a reciprocating motion. Therefore, the trapped frictional heat generated by excessive pressure "cooks out" the packing lubricant and the dry packing either burns, or breaks down and erodes the shaft.

Braids are often confused with plaited construction but the two types are different. A braid has a hard dense structure which withstands abrasive effects of reciprocating motions and it finds wide application in reciprocating pumps, valves and expansion joints. Both plait and braid have distinct advantages combined in a fourth type of packing braided diagonally; it has the density of braided construction but the flexibility of a plaited packing. Most of large suppliers offer such packing under various names. Laminated packings, a fifth construction, are built up of eithe-horizontal or diagonal layers and can be obtained either soft or cured "rock-hard." One of popular lamination is known as "cross expansion." These make ideal packings for pump seats, seat rings, and anti-extrusion rings because their dense construction resists distortion.

Various wrapped packings are also produced. These usually involve a folded or concentric construction around a core of duck, rubber or even metal. Wraps are also produced with hollow cores. Rod type packings, except for such materials as metal foils, are usually impregnated with a compound of graphite and oil. At one time a single oil probably was made to suffice no matter what the sealing job. But today the various oils used have been specifically developed for insolubility in the respective fluids to be sealed. Impregnation of the packing accomplishes two worthwhile purposes. Filling the voids among the fibres of the material, it improves the sealing qualities of the packing, and provides lubrication for the rod or shaft as the impregnant is forced from the material by pressure of the gland nut.

Some suppliers coat the packing with lubricant by drawing or dipping the finished product in a bath. Others carry the idea further and impregnate each strand prior to braiding, plaiting, or twisting. The maximum and uniform penetration thus gained deposits sufficient impregnant within the cross-section of the packing to respond to the pressures of subsequent adjustments of the gland nut.

A discussion of impregnants is not complete without mentioning Teflon. In liquid form it is a highly effective impregnant for asbestos packings in acid and alkaline services. Cost, however, is a limiting factor and a real need should exist before it is specified.

Properly installed, a rod seal should never be jammed into a gland. The pressure that will seat the fresh rings should come exclusively from adjustment of the gland nut. First, all of the expended packing material should be cleaned from the gland. The two lowest rings in the set will probably look almost as fresh as the day they went in because most of the "squeeze" shows up in the compression of only the tip rings. But much of the impregnant in the lower rings has also been consumed. And in a short time you'll be calling on burned out packings in the bottom of the gland to do the sealing job of fresh rings. Therefore, discard all old rings and re-pack with fresh material.

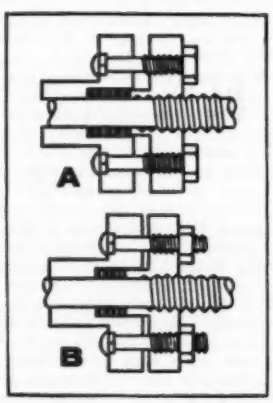

Fig. 1. A shows freshly packed gland. Note compressed rings in B. It is time to re-pack

Hand-Tight Gland Ring

The gland ring should be installed over the new packings, and fastened down only hand-tight. A compression packing is supposed to limit leakage, not stop it. In fact, a certain amount of leakage is desirable to help lubricate the rod or shaft. If an attempt is made to stop leakage by tightening down hard on the gland nut, the impregnant in new rings is being expended needlessly. Adjustment after adjustment is necessary and the packings are soon squeezed dry. Too much initial pressure on the gland nut is the prime cause of short-lived packing installations.

Another error in the installation of a rod seal packing occurs when a length of the material is looped into the gland or wrapped around the shaft. Installed in this manner, the material cannot seat itself to fill the gland properly. No matter whether the packing is being used from a coil, spool, or spiral, individual rings should be cut for scarf or butt joint and installed one after the other in the gland with the joints staggered at 90 or 180°. The "lay" of the rings can be further improved by the use of packings which have a squared cross section. Many suppliers square their materials as a final production operation.

Fit Gaskets Tightly

The bolting action on a freshly gasketed joint is called "seating force." After the gasket is installed the joint is immediately

• *Hydraulic Engineer, E. F. Houghton and Co., Philadelphia, Pa., U.S.A.*

bolted down tightly with enough seating force to generate a "flow" of the gasket material into the scratches, imperfections, and irregularities of the joint faces. This is the basic principle by which the gasket seals. The initial loading on the bolts can be reduced without damaging the seal.

Sheet-type packings are every bit as specialised in their usage as are rod seals, and as much care should be given to their specification. Homogeneous Buna N, for instance, is specified for its high resistance to oil. This implies low solubility, swell, and abrasion, plus a retention of tensile strength after immersion. Buna N does well against alkalis, petroleum solvents, etc., over a temperature range of — 60 to + 300°F.

But a serious shortcoming of Buna N in certain applications is its poor resistance to sunlight and climatic conditions. This material seals well in air and water and is actually more water-resistant than natural rubber. Its useful temperature range extends from about — 60 to + 25°F.

In its mechanical properties, homogeneous Neoprene is closer to natural rubber than most of the other synthetics. It is vibration resistant and has good compressibility and recovery. The Neoprene gasket will not corrode the metal joint faces with which it is in contact because Neoprene is not vulcanised with sulphur. Neoprene seals well against non-aromatic gasolines, air, water, high analine oils, and refrigerant gases.

The above summary by no means completes the list of homogeneous rubber sheets being used today. One of the properties peculiar to homogeneous rubber is hardness as measured by a specialised instrument called a Shore durometer. In general, lower durometer (softer) rubber should be used for more irregular joint faces, and when the gasket is to be secured between the flanges by light bolt loadings. Higher durometer rubber should be used with more heavily-loaded bolts and for smoother surfaces on joint faces.

Compressed rubber and asbestos sheets are produced by mixing the shredded asbestos and raw rubber polymer with a solvent. Neoprene, Buna N, and Buna S are a few of the synthetics regularly compressed with asbestos to form sheet packing materials. The Neoprene compression finds application in aircraft gaskets. It is a non-absorbing, minimum swelling packing and retains its tensile strength in low pH, heat, and solvents.

The Buna N compression has exceptional heat resistance, and its applications include sealing caustic soda, petroleum, and chlorinated hydrocarbons. Buna S and asbestos has special properties which equip it to do a good job in superheated and saturated steam over a fairly broad temperature-pressure range. It can also be used in air, some gases and acids.

Vegetable fibre, known among maintenance men as "paper" packing, also belongs in the category of compressed sheet material. It is constructed of fibrous material impregnated with a chemical compound to fortify its sealability. This material is economical and provides an effective seal for water, compressed air, and inert gases. But temperatures and pressures should not be extreme. Where temperature is above 200°F, one of the compressed rubber and asbestos sheets will probably be the answer.

Yarn Dyeing with Reactive Dyes

REACTIVE dyes, and in particular the cold dyeing Procion dyes, were of particular interest for dyeing yarns for a wide number of end uses, e.g. dress fabrics (particularly knitting yarns), furnishing and upholstery materials, towellings for beach wear, carpet yarns, yarns for table linen and narrow fabrics of various types, said Mr. J. A. Fowler, M.A., A.R.I.C., in a recent address to the Macclesfield, Leek and District Section of the Textile Institute. Methods of application, he went on, included dyeing in conventional hank and package dyeing equipment of all types, for cotton, viscose and Bemberg rayon yarns.

The cold dyeing process was easy to operate and there were no difficulties in compatibility of the Procion dyes in mixture shades. Reproducibility of shade compared favourably with other classes of dyes provided careful control was exercised over the various factors influencing the dyeing process, notably pH, temperature, electrolyte concentration, duration of dyeing and the liquor to goods ratio.

Adequate "soaping-off" at the end of the dyeing process was not in all cases easy to achieve, more particularly when dark shades were dyed with high affinity Procions in package dyeing machines. It was particularly important to remove all loose colour where the dyed yarns were subsequently to be woven or knitted up with white or light coloured yarns. In some cases, therefore, the use of a cationic dyeing agent (e.g. Fixanol PN) was advised, as an insurance against incomplete soaping-off.

Heavy red shades had occasionally given difficulty in the past due to the splitting of the dye-fibre link under conditions of humid and acidic storage, resulting in the formation of a small amount of loose dye. It was now found that this could be very much reduced by the inclusion of ethylene diamine in the "soaping" bath after dyeing. Such a process was substantially without effect on the shade and fastness of the dyeings.

Cold dyeing Procion dyes were also of interest for a novel continuous dyeing procedure for yarn (and also for narrow fabrics) by the so-called pad (bicarbonate) —dry technique. This had been successfully adopted in bulk for yarn by utilising slasher sizing equipment. Cold dyeing Procion dyes were also of interest for the production of brilliant greenish-yellow and yellowish-green shades of very high fastness to light, washing and gas fumes, in combination with solubilised vat dyes, e.g. Soledon Jade Green XS. The Procion and Soledon dyes were applied from the same dyebath by the normal Procion dyeing method and after fixation of the Procion dye, the Soledon was developed, cold.

Procion H dyes were generally of less interest for batchwise dyeing, a notable exception being Procion Brilliant Blue H7GS, much used for fast, brilliant turquoise shades. Some of the other H Brands, e.g., those exhibiting the best affinity, were also of interest for certain package dyeing applications, notably filament viscose rayon cakes, where the cold dyeing brands did not give satisfactory results. The H brands were distinguished from the cold dyeing brands by requiring larger quantities of electrolytes to promote exhaustion, higher temperatures (normally 60 - 85°C., depending on the dye) and stronger alkalis.

Procion and Procion H brands were also of interest for bright wet-fast shades on pure silk, and (with certain reservations) to wool and polyamide fibres also. A further and very important development in the field of reactive dyes had been the marketing by I.C.I. in 1959 of the first reactive disperse dyes, the so-called Procinyl dyes.

These are of particular importance for polyamide fibres, i.e. nylon, and combine the attractive level dyeing properties of conventional disperse dyes with the high level of wet fastness associated with acid dyes.

The initial range consists of four members—yellow, orange, scarlet and blue —fully compatible with each other and all exhibiting brilliance of shade and exceptional fastness to wet and heat treatments. Light fastness is similar to the normal level of disperse dyes.

Concluding, therefore, it may be said that reactive dyes continue to progress— the Procinyl dyes for nylon representing another milestone along the road. There still remain a number of targets, e.g. for a widening of the shade range in both the Procion and Procinyl series, particularly in binary and ternary tones and also in respect of fastness properties; it is hoped that an answer can be found in many of these outstanding questions.

WOOL TEXTILE DICTIONARY. Lanerossi, Via G. B. Pirelli, Milano, Italy (price 3s. 4d.). Although the title indicates specialisation, this inexpensive publication is, in fact, a general textile dictionary including many textile terms only remotely connected to the Woollen industry. It is, of course, all the better for that as many spinning, weaving, dyeing, etc. terms are equally applicable to the other textile industries. Printed in English - Italian, Italian - English the work has been coupled in a thoroughly efficient manner and is well worth a place on any textile man's library shelves.

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CONDITIONING HOUSE DIARY. Bradford Conditioning House, Canal Road, Bradford, Yorks. (price 6s. 6d.). This useful little pocket reference work for 1960 maintains the high standard established in previous years. It includes valuable information on Conditioning House rules, reception of goods and testing instructions, together with moisture tests on tops, wools and noils, and yarn tests for moisture, count, strength and twist. Many other items of information are featured in this low priced, illustrated little diary.

Export Opportunities

U.S.A.:
Hay Baler Twine

Dayton Importers Corporation, 322 S. Patterson Boulevard, Dayton 2, Ohio, would like offers from U.K. manufacturers of hay baler twine in the standard put-ups of two 20-lb. tubes of twin running 250 ft. to the lb. or average footage on bale 10,000 ft., having a tensile strength of 290 lbs. packed in paper bags to their specifications as to printing and labelling. Quantities in the first instance would run to 50,000 bales. Dayton Importers Corporation, were started in 1957 as importers and wholesalers of twin, ply-goods, cotton and paper bags. Their sales are made to industrial concerns throughout the mid-western States. Manufacturers interested in this enquiry should write by air mail direct to Mr. Lumby with prices quoted c.i.f. Baltimore or Great Lakes seaway, Chicago area, also copy correspondence to the British Consulate-General, 1828 The Illuminating Building, Cleveland 13, Ohio.

U.S.A:
Bias Binding

A. M. Kroop and Sons, P.O. Box 106, "C" Street, Laurel, Maryland, have informed the British Consulate at Baltimore that they would like to contact U.K. manufacturers of bias binding cut from plastic coated fabric. Established in 1938 as shoemakers, they now concentrate on the manufacture of boots for jockeys and horsemen, etc. Manufacturers interested should write direct, also copy correspondence to the British Consulate, Suites 611 and 612, Keyser Building, Calvert and Redwood Street, Baltimore 2, Maryland.

Western Germany:
Tulle Piece Goods

Margarete Sattler, 28 Schlosstr., Berlin - Steglitz, would like offers from U.K. suppliers of tulle for bridal veils. Established in 1953, the firm manufactures bridal veils and embroidery work, and are also in the wholesale trade in tulles and lace. Suppliers interested should write direct, also notify the British Consulate-General, Charlottenburg 2, Uhlandstrasse 7 - 8, Berlin.

Tunisia:
Waterproof Piece Goods

Societe-Tunisienne d'Habillement, 23 - 25 Avenue Jean Jaures, Tunis, want to contact U.K. suppliers of all types of waterproof materials, especially cotton or mixed gaberdines. Their estimated annual output will be in the order of 300,000 articles a year and they hope to produce about half the waterproof clothing sold in Tunisia. Manufacturers interested should write direct also notify the Commercial Section, British Embassy, 5 Place de la Victoire, Tunis.

South Africa:
Printed Linens, etc.

R. J. Cole (Pty.) Ltd., Essanby House, Jeppe Street, Johannesburg, are interested in obtaining new agencies for the Transvaal area for U.K. printed lines, tapestries, brocades, etc. They are an old-established firm of manufacturers' representatives specialising in high quality soft furnishings and upholstery tapestries, and the territory covered is the Transvaal only. Manufacturers interested should write direct, also notify the U.K. Trade Commissioner, P.O. Box 10101, Palace Buildings, 52 Pritchard Street, Johannesburg.

Italy:
Cotton Prints

The firm of Lacas, Via Conte Verde 32, Rome, would like offers from U.K. manufacturers of printed cotton piece goods for making aprons. Manufacturers interested should write direct, also notify the Commercial Department, British Embassy, Villa Wolkonsky, Via Conte Rosso 25, Rome.

Trinidad:
Piece Goods and Household Textiles

Wilson and Johnstone Ltd., P.O. Box 431, Port of Spain, would like additional agencies for U.K. manufacturers of suitings, woollen goods, cotton piece goods, linen goods, towelling and household textiles. Established in 1929, they already represent many U.K. concerns for many varied commodities. Manufacturers interested should write direct, also notify the U.K. Trade Commissioner, Colonial Buildings, 72 South Quay, P.O. Box 225, Port of Spain, Trinidad.

Netherlands:
Piece Goods

Mr. L. Polak, Uiterwaardenstraat 77/1, Amsterdam-Z, would like to represent U.K. manufacturers of woollen and cotton piece goods suitable for the ready-made clothing industry. Established in 1949, he is a textile agent operating mainly on a commission basis. Manufacturers interested should write direct, also notify the British Embassy, Commercial Department, Lange Voorhout 32, The Hague.

Western Germany:
Linen and Chintz

The firm of Hugo Schubert, Nachf. Klara Jancke, 96 Knesebeckstr., Berlin-Charlottenburg, would like to represent U.K. manufacturers of linen and chintz furnishing fabrics. Founded in 1920, they now operate as wholesalers and agents handling furnishing fabrics with retailers and interior decorators. Manufacturers interested should write direct, also notify the Commercial Section, British Consulate-General, Charlottenburg 2, Uhlandstrasse 7 - 8, Berlin.

Western Germany:
Woollen Yarns

Klaus and Hans Pade K.G., 76 Potsdamer Strasse, Berlin W.35, want to contact U.K. suppliers of machine knitting woollen yarns (scoured). The yarns would have to conform with the West German standards N28 (double strand) and N40 (double strand). Established in 1949, they are wholesalers for wools, yarn and stockings. Manufacturers interested should write direct, also notify the Commercial Section, British Consulate-General, Charlottenburg 2, Uhlandstrasse 7 - 8, Berlin.

Canada:
Blankets

Mr. G. Precious, 141 Water Street, Vancouver, B.C., is interested in handling on commission a line of wool blankets. A manufacturers' representative, he handles chiefly U.K. lines and covers the Provinces of British Columbia and Alberta and also the states of Washington and Oregon in the U.S. Suppliers interested should write direct, also notify the U.K. Trade Commissioner, The Mercantile Bank Building, 540 Burrard Street, Vancouver, B.C.

Ceylon:
Cotton and Woollen Piece Goods

Mackwoods Ltd., Colombo, are interested in obtaining a sole U.K. agency for drill, poplin, cotton and woollen suitings. An old established import and export firm, they handle a wide range of agencies and cover the whole of the island with vans and commercial travellers. Manufacturers interested should write direct, also notify the U.K. Trade Commissioner, P.O. Box 745, 2nd Floor, Hongkong Bank Building, Prince Street, Colombo.

Libya:
Piece Goods

S. Vaturi, 139 Giaddat Istiklal, Tripoli, Libya, are interested in purchasing and representing U.K. suppliers of "Terylene," "Acrilan" and similar materials for women's wear. They are reported to be one of the largest textile retailers in Tripoli, and manufacturers interested should write direct also notify the Commercial Section, British Embassy in Libya, 30 Sciara Adrian Pelt, Tripoli, Libya.

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TEXTILE MACHINERY and MILL EQUIPMENT NEWS

Economic Features of New Loose Boss Roller Oiler

A new mechanical oiler enables operatives to keep their hands and fingers free of oil and, at the same time, reduces roller shell handling to a minimum

THE importance of clean, regular yarn cannot be over-emphasised in these days of intensive competition and greater accent on quality control. Yarn cleanliness deserves particular attention, as oil-stained yarns and their resultant fabric imperfections will no longer be accepted by the manufacturer.

To minimise this pernicious oil staining anomaly, and to achieve considerable economies in time and costs, Mr. H. Sunderland, 82 Kelverlow Street, Oldham, Lancs., has designed and patented a semi-automatic top loose boss roller oiler, at present undergoing extensive tests in several Lancashire mills.

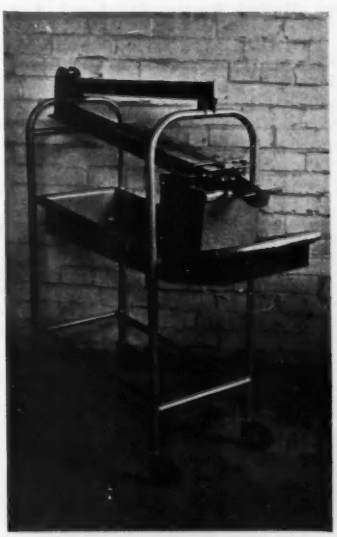
Results have already shown a complete absence of oil on the loose shell rollers, with attendant clean yarn. A laborious expensive task has thus been transformed into a simple, rapid and efficient maintenance operation. Automatic oiling by the Sunderland oiler ensures non-soiling of the operative's fingers and a measured amount of oil delivered to the spindle arbour; the latter is particularly important as excess oil results in splashing, seepage and lint or fly adherence ultimately leading to a lowering of yarn quality. With the obsolescent oiling method at present used in most mills, oily fingers and thus, oily shells could not be avoided: the spindle was handled during oiling, and the shells refitted immediately. Consequently, roller covers became oily, resulting in stained yarn. Using the new machine, however, the operative's fingers are kept completely oil-free and shell handling is reduced to an absolute minimum.

Handling of the shells is unnecessary with the Sunderland oiler, resulting in considerably cleaner, oil free yarn (courtesy, Rugby Mill, Chadderton)

Constructional and Operational Features

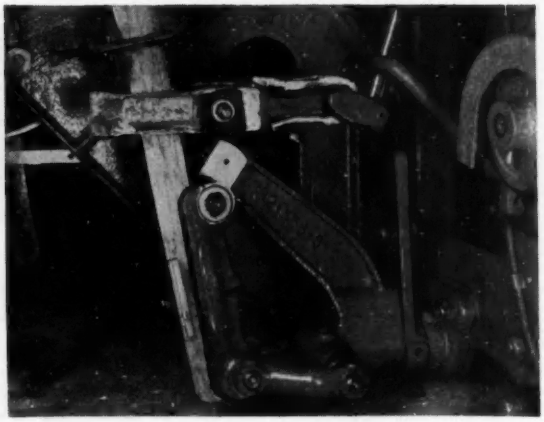
Attractively finished in polychromatic green and robustly constructed to stand up to a lifetime of mill wear and tear, the new oiler is mounted on a wheeled tubular steel-framed trolley on which is fitted an oil tank with integral pump and external oil level gauge. Mounted on top of the tank is a bracket carrying two V-blocks with oil-ways drilled to lead into the base of the V. A nylon oil pipe leading into the oil tank, is connected to each block. Also mounted on the bracket is a spindle stop adapted to locate a spindle in the blocks. A gravity feed magazine delivers one spindle at a time to rest on the V-blocks at the pressing of a lever; at the same time a measured amount of oil is pumped on to each arbour. A further depression of the lever allows the oiled spindle to move forward into a position ready to receive the shell rollers; the cycle is then repeated until the frame is completed.

One or two persons operate the machine. Where two are used, one removes the shells from the spindle allowing it to roll onto a tray beneath where it is cleaned and placed on the two-storey feed by her partner. The loose shells are then placed on the newly-oiled spindle and the roller replaced. The procedure is repeated until the length of the frame has been traversed. The manufacturer claims that a frame of 400 spindles can be dealt with in fifteen minutes, and taken over a year this obviously presents considerable economies both in labour saving and costs.



Extremely mobile and strongly built, the apparatus has achieved considerable economies in mills

Swinging Link Parallel on Rayon Loom



Hattersley's swinging link parallel

A NEW form of parallel picking for their Model 382 silk and rayon loom has now been introduced by George Hattersley and Sons Ltd., North Brook Works, Keighley. In this motion, the arc that would normally be described by the picker, if the stick hinged on a fixed pivot, is cancelled out by a swinging link of suitable radius working in conjunction with a floating hinge at the bottom of the stick. An eccentric bush forming the axis of this hinge enables accurate adjustment to be made to the "lift" of the picker. Advantages cited include: positive control of picker, accuracy of shuttle flight eliminating shuttle marking, reduction in the power consumed, quietness and ease of adjustment. These features are also claimed to allow higher loom speeds, with less attention from the tuner.

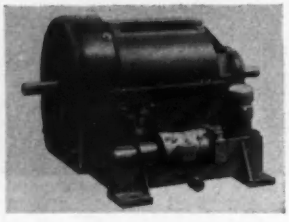
New Device for Applying Polythene Wraps

To operate, press end of pack against front edge of the aid. Slide the pack towards the slot and press down. Repeat the operation with the other end of the pack

THE BCL Polywrap aid, recently introduced by British Cellophane Ltd., Henrietta House, 9 Henrietta Place, London, W.1, makes it possible to hand-overwrap trays and cartons in polythene film quickly and neatly. Designed to suit packers whose output does not economically justify the use of fully automatic equipment, this moderately priced unit will effectively handle trays and cartons of any size up to about 14 ins. × 15 ins. × 4 ins.

The BCL Polywrap aid consists of an 18 ins. × 14½ ins. working platform, a 15 ins. × ⅝ in. heater bar mounted directly below a slot near the front edge of the platform and a blind of PTFE-impregnated glass cloth interposed between platform and heater bar. The platform, of matt-chromed steel, is hinged at the rear and cushioned on two springs at the front so that the heater bar is kept clear of the working surface until the platform is depressed. The glass cloth prevents the film sticking to the heater bar. The sealer comprises a 60 watt coil element wound in a silicone tube set in an asbestos composition block immediately beneath the aperature in the platform. The element reaches a maximum temperature of 150°C. which allows for heat loss due to the PTFE blind, yet gives a good seal with minimum dwell time.

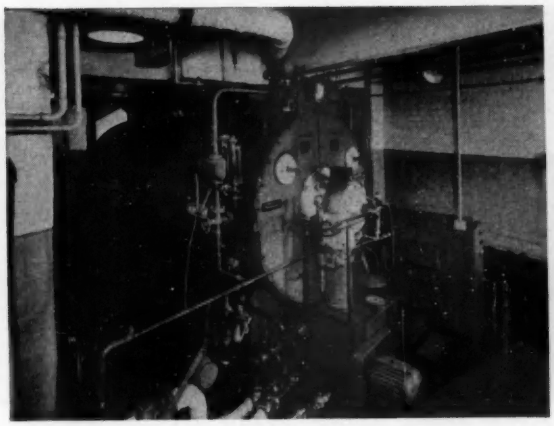
Hydraulic Variable Speed Gears



AL50 hydraulic variable speed gear

THE AL50 hydraulic variable speed gear is the latest addition to the range of infinitely variable speed gears now available from Carter Gears Ltd. in ten sizes for drives from fractional up to 40 h.p. The size AL50 is capable of giving a smooth stepless range of output speeds from input speed down to about 25 r.p.m. and may be used to pick up loads from zero r.p.m. It may be driven in either direction of input rotation and if specially ordered a reverse drive of up to 5% of input speed can be provided without reversal of the driving motor. Full reverse speed range can be obtained by reversing the input rotation.

Housed in one compact dust proof case which also acts as an oil reservoir, the internal mechanism, although not immersed in or dipping into the oil sump, is entirely self-lubricating. The size AL50 is equipped with a built-in make-up pump, driven by a separate fractional horsepower motor, and fitted with an efficient oil filter unit. The pump motor and main driving motor starters should be electrically interlocked so as to ensure that the main motor can only be started and will only continue to run when the pump motor is running. Handwheel and remote electrical controls are available as standard and these may be fitted at either side of the gear speed setting adjustments may be made with the drive either running or stationary, an advantageous feature for many variable speed applications. Output speed/control movement relationship is approximately linear.



The new model 125 Powermaster burns oil of 950 secs. Redwood No. 1

A large amount of steam is used in the final pressing room where 28 steam presses are employed

Packaged Boiler Reduces Steam Costs

THE large number of retail branches distributed throughout the country have made the name of Jackson the Tailor well known to the British public. Supplying these establishments are a number of manufacturing units and one of the largest, situated in Liverpool, is devoted to the production of men's jackets, suits, overcoats, etc. Approximately 650 personnel are employed, the bulk working in the cutting room, trouser room, coat room, and press room.

Recently the company purchased a new boiler for the Liverpool works, and have since experienced a saving in running costs without loss of output or overall general efficiency. In 1950 as a result of the creation of a smokeless zone in the city, the company replaced two old coal-fired boilers by a gas-fired vertical unit, which gave good service for eight years. However, the rising cost of gas influenced the company to seek another dependable unit with lower running costs.

The new boiler is a Model 125 Powermaster packaged, fully automatic, oil-fired unit capable of producing 4,312 lbs. of steam per hour. Manufactured by G.W.B. Furnaces Ltd., Dudley, Worcs., this boiler is of 3-pass horizontal fire-tube design, and incorporates the air atomising Voriflow burner. The whole of the boiler equipment occupies floor space measuring 14 ft. × 6 ft. 9 ins. wide and was delivered works tested ready for connection to the various supply lines.

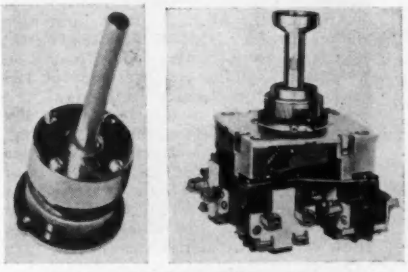
Steam provides all the space heating throughout the works and offices. This heating is mainly provided by the 3-in. steam mains, however, in the offices and surgery, steam radiators are installed. The necessary hot water supply is provided by steam calorifiers, whilst in the canteen the hotplate is steam heated. As regards process usage, steam irons are in use throughout the works, and a large number of Hoffman presses, using pressures of up to 80 p.s.i. are employed in the trouser room and pressing department.

The use of such equipment as steam irons and presses leads to widely fluctuating loads and makes heavy demands on the boiler equipment. The automatic modulation of the Powermaster ensures that changes in load are met and maintained with minimum delay. It has also been found that in the morning the Powermaster reaches the required pressure in approximately 15 mins. The oil consumption is approximately 900 to 1,000 galls./week.

New Heavy Duty Control Units

TWO new additions to the range of oil-tight heavy duty control units are announced by Square D Ltd., Cheney Manor, Swindon. One is the joy stick operator, Type TX, which is actually four push buttons in one unit. The operator allows operation in any one of four positions by means of a single lever. The joy stick is available as either a momentary or maintained contact operator with or without an off position latch. A mechanism in the handle requires depressing before allowing movement of the operating handle. Each operating position of the handle has a correspondingly numbered latch bar. Individual latch bars can be removed allowing the handle to be moved from the centre or off position to the operating position correspondingly numbered without having to depress the release pin (the pin in the handle which operates the off position latch). Any of the operating lever positions can be changed from momentary to maintained contact by moving the lever pin from the 1st to 2nd slot. This conversion can, of course, be reversed.

The second unit is the Type TW-1 wobble stick operator designed to replace any standard Type T push-button operator. It is actuated by pushing the lever in any direction and, because of this method of operation, is particularly suited for use as an "emergency stop" operator on a pendant type station where it would be desirable to reach the operator quickly from any direction.



(Left) Class 901 Type T.W.1 wobble stick operator. (Right) Class 901 Type T.A. joy stick operator

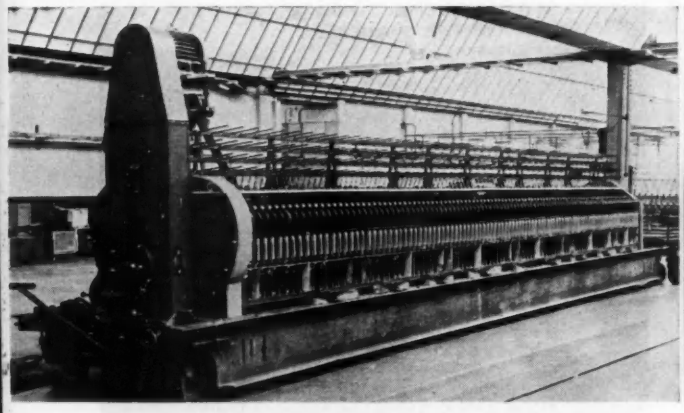


Fig. 1. The machine here is clamped to the cradle and jacked up ready for movement

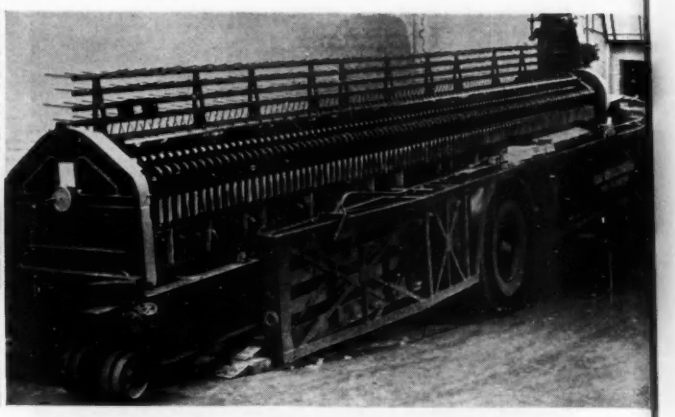


Fig. 2. The frame being loaded on to the trailer

Moving Spinning Frames Without Dismantling

IT is always good to hear of firms successfully overcoming technical problems and particularly pleasing when they make their experience and the knowledge gained known to all interested in the industry. In this connection, readers will undoubtedly appreciate details of the method developed by the engineers of Patons and Baldwins Ltd., Darlington, for moving complete spinning frames without dismantling them. This has been used primarily for the re-organisation of the company's factory at Alloa, Scotland. The procedure was to take the two specially adapted rolled steel joists and place them on the ground alongside the machine. The main members of the frame were then clamped to the joists, and the joists themselves joined at each end to form a rigid cradle. The whole assembly was then jacked up and heavy castors locked into position at each corner. The machine could then be towed to any position required, and in practice no machine was out of operation for longer than three working days.

Recently it became necessary to transfer spinning machines from the factory at Darlington, to Alloa, Scotland, and with the co-operation of Road Services (Forth) Ltd., the machines were loaded bodily on to trailers and moved a distance of 180 miles in their assembled condition.

A move of this nature would normally entail a week for dismantling and packing, and 2/3 weeks for re-erection. With this new method the rate of movement has been two machines per week and no frame has been out of production for more than four days at a time. The three illustrations show very clearly methods employed.

(1) The machine here is clamped to the cradle and jacked up ready for movement.

(2) The machine being loaded on to the trailer.

(3) All in position and ready for movement at Darlington.

The company point out that breakages during the move were of a minor nature and probably less than the breakages which would have been incurred during the normal method of dismantling and re-erection.

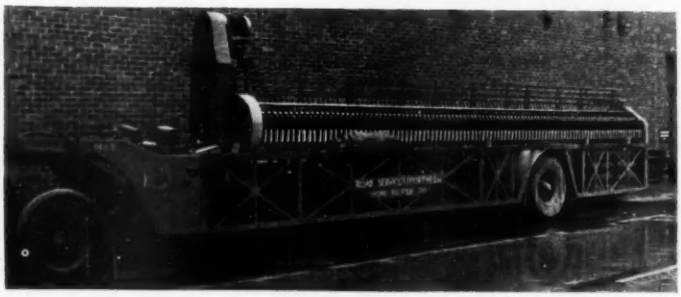


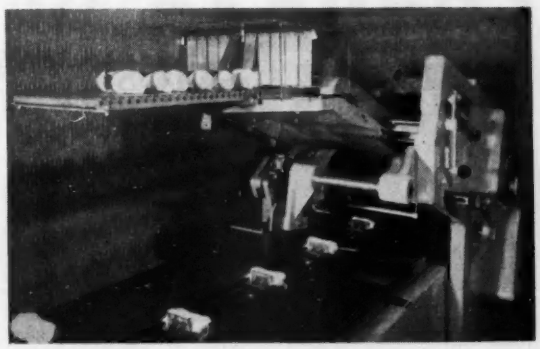
Fig. 3. All in position and ready for movement by road to Alloa, Scotland

Universal Wrapping Machine

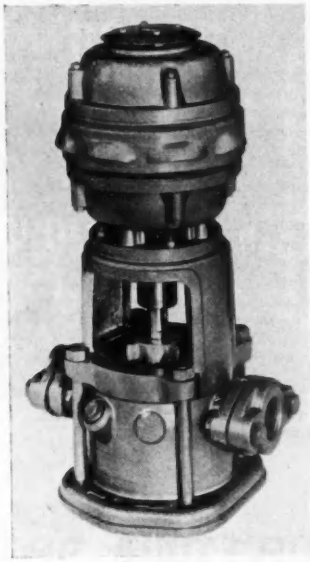
THE BW-6 wrapping machine, made by Foxgrove Machinery Co. Ltd., Dewsbury Road, Leeds 11, is suitable for handling most heat-sealing grades of cellulose film taken from a reel; cellulose film laminates can also be used. In addition, a photo-electric cell unit can be attached for the registration of panel-printed wrappings. The machine is fed by hand, the articles to be wrapped being placed in front of the flights or paddles on an intermittent chain conveyor. In the case of balls of wool, for example, one strand is left protruding over the infeed paddle. If the wool was inside wound the final wrap became a simple dispenser pack; outside wound, the protruding end acted as the tear tape. The articles are carried to the elevator position on the intermittent conveyor. At the elevator the wrapping material is held between the elevator receiving plate and the leading edge of the article, to prevent the wrapping material slipping during the subsequent folding operations. As the article is pushed forward by the infeed paddle, the free end of the wrapping material is folded under the article by the elevator bottom plate, thus making the underlap. During forward stroke of the infeed paddle, the elevator

folders make the first end folds. The elevator then lifts the article to the discharge incline, and during this movement the second end folds are made.

The discharge pushers then eject the article from the elevator and at the start of this movement the underlap roll moves downwards pulling extra wrapping material from the reel. The knife then cuts the wrapping material, the free end of which is carried down between the elevator and the infeed unit ready for the next article. As the discharge movement continues the underlap is completed and the third and finally the fourth end folds are made just before the wrapped article reaches the heat-sealing unit. The package remains in the heater unit for one machine cycle and during the following cycle discharge pusher extensions push the article into the discharge flight for conveyance to the roller discharge. The wrapping material feed is so arranged that no wrapping material can be fed unless an article is in a position to be wrapped; this feed is also self-measuring. Speed of output can be varied from 15 to 35 wrapped articles per minute.



Foxgrove B.W.6 Universal wrapping machine is suitable for handling most grades of heat sealing cellulose film on reel



General Purpose, Self-Priming Vertical Pump

THE Pep-Loewe range of centrifugal pumps, made by Precision Electrical Products (Stockport) Ltd., Lytham Street, Cale Green, Stockport, has been increased by the addition of a new vertical self-priming unit, the VRL.225. The new pump is robustly designed for general purpose pumping duties and primes quickly, the dynamic suction lift amounting to as much as 28 ft. when pumping cold liquids. The capacities and heads available are 70 g.p.h. at 100 ft. of liquid and 400 g.p.h. at 25 ft. The pump occupies less than 1 sq. ft., which is of considerable advantage where a unit of comparable power has to be installed in a confined space.

The VRL. 225 incorporates several new features. The casing is designed so that if the foot valve on the suction line should be inoperative the pump will continue to work. The impeller, specially shaped, is fitted with very short blades to prevent breakage on bending, and is also fixed so that it is not in contact at any point with the casing. Pump and motor shafts cannot become misaligned since they are rigidly coupled by a new type of special split coupling.

Electronic Motor Control

ELECTRONIC motor control equipment, known by the trade name "Emotrol," is an important product of the New Parks factory at Leicester of A.E.I. Electronic Apparatus Division. Equipment such as that shown here in the final stages of manufacture, provides automatic stabilisation of motor speeds over wide speed ranges within very close limits—despite wide variations of load and supply voltage. Under normal conditions the speed range is 10 : 1 or 20 : 1, but for special applications a speed range of 100 : 1 can be obtained. The "I.R. drop" compensation gives a level speed/torque characteristic from no-load to full-load. The accuracy of speed regulation at any top speed with load variation from within the motor rating is $\pm$ 2%, although for applications where a closer speed regulation is required accuracies of $\pm$ 0·2% can be achieved.

Other important advantages of "Emotrol" may be summarised as follows: smooth acceleration from standstill to full speed under all load conditions; current limit, by which the motor cannot take more than 122% of its full load current even if stalled; dynamic braking which brings the motor to rest rapidly when the stop button is pressed; and, above all, a smooth, stepless control of the motor speed over the whole speed range. "Emotrol" control equipments can be supplied for motors ranging from $\frac{1}{4}$ to 600 h.p. They are now used for the control of most industrial drives, recent applications including machine tools, glass-working machinery, textile plant, wire and cable reeling equipments, printing presses, paper-making machines and plastic extruder machines, etc.

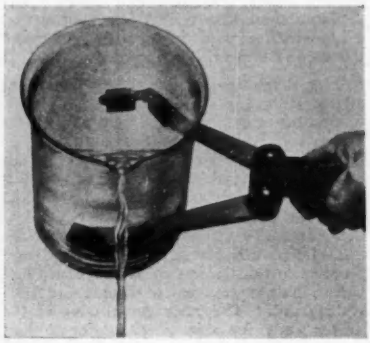
"Emotrol" control panels being made in works of A.E.I. Electronic Apparatus Division, New Parks, Leicester

Handling Corrosive Acids, etc. in Laboratories and Works

WELL known as makers of laboratory and industrial glassware and general laboratory suppliers, Loughborough Glass Co. Ltd., Loughborough, have recently put on the market cleverly designed beaker tongs which enable hot and corrosive liquids to be handled safely and simply in containers of 2 to 6 ins. dia.

These tongs, diecast in a special aluminium alloy for lightness and strength, are operated by a lever in the hand grip which allows free manipulation of both tongs and container with one hand. The special pads fitted to the jaws of the tongs are moulded in vulcanised polythene which has excellent non-slip qualities and high resistance to heat and chemicals.

The company also offer a range of plastic items of interest to users of corrosives, e.g., gloves, aprons, bottle carriers, syphons, etc., and a whole list of rigid polythene containers.



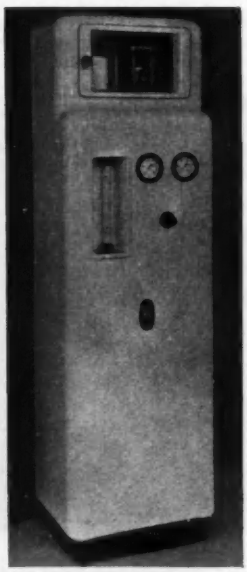
Vulcanised polythene, non-slip pads grip the beaker securely

A New Flow-Recording Chlorinator

THE newly-designed chlorinator, produced by Chlorination Equipment Ltd., 129 Kingsway, London, W.C.2, is now available with a flow recorder incorporated in its construction. The unit is installed in the head of the equipment and readings can be taken at a glance through a glass panel of ample proportions. The recorder operates from the metering differential which is transmitted to coupled bellows and is obtained by connections across a specially designed valve inserted between the vacuum regulator outlet and the meter inlet. The vertical movement of the bellows coupling controls the pen-driving mechanism. A continuous recording is provided on the seven-day drum chart which is calibrated in lbs. of chlorine per hour and which displays a generous area to facilitate the observation of past readings. The drum is operated by an eight-day clockwork mechanism.

The cabinet, made of polyester-impregnated glass fibre, requires no repainting. The injector block, chlorine regulator, valve body and piping are made from plastic materials specially developed for their chlorine and water-resisting properties. Corrosion resistant alloys are used where metal parts are unavoidable. To enable the operator to alter the capacity of the instrument the chlorine flow meter and the control valve stem and sleeve assembly are situated in an easily accessible position as indeed are all the major components.

This chlorinator is produced in two types: type NMF for manual operation and type NAF for fully automatic dosing, each type being available with thirteen meter sizes ranging from maximum capacities of 0·125 lbs. to 40 lbs. of chlorine per hour with a control range of 10 to 1. A supply of charts, sufficient for two years' operation, calibrated according to capacity is provided with each instrument.



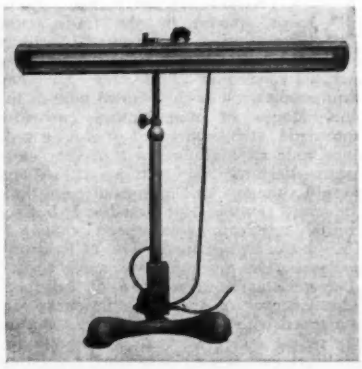
Flow recording chlorinator

Mobile Fluorescent Lighting Unit

THE Type A130 mobile model using a 4 ft. × 40 watt tube, is the latest addition to the range of portable fluorescent work and inspection lights manufactured by P. W. Allen and Co., 253 Liverpool Road, London, N.1.

Fully adjustable the A130 is designed to provide cool, glare and shadowfree light for both maintenance and construction workers in many sections of industry and it should be of considerable value in all textile manufacturing departments. The unit employs 4 ft. × 40 watt fluorescent tube housed in a metal reflector with a clear "Perspex" front cover. The reflector can be moved in any direction and locked as required, the telescopic column allowing for adjustment in height.

The three-legged heavy base has large diameter rubber-tyred castors for ease of movement and is perfectly stable regardless of lamp position. The necessary control gear and switching is contained in a metal case at the base of the centre column.



Allen A.130 inspection light

Oil-fired...POWER-PACKED!

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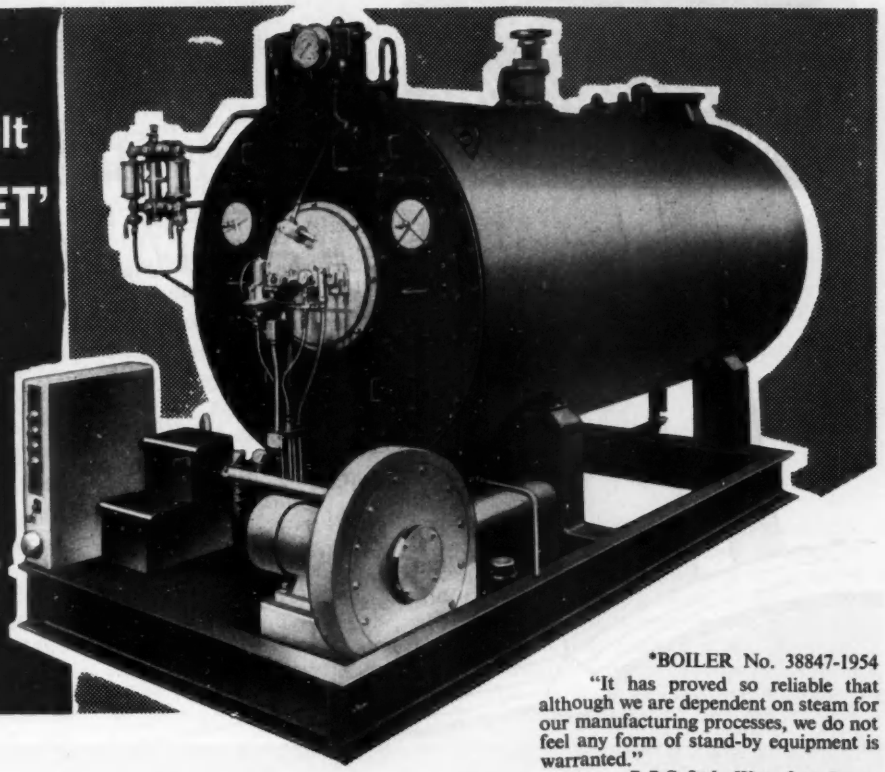
'STEAMPACKET' PACKAGE BOILER

with the Superb

CRADLEY-RUDLING M.P.A. Oil burner



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R.B.S. Ltd., Waterfoot, Lancs.

THE BOILER WITH THE BALANCE OF POWER!

Wet-back construction and flanged rear tubeplates provide adequate expansive movement so that a cold boiler can safely be brought to full steam in 45 minutes.

Easy access to combustion chamber without disturbance of firebricks.

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Over 80% efficient, fully automatic and smokeless.

Only requires connecting up to be ready for work.

Evaporates 1,010 lbs. to 10,500 lbs. per hour from and at 212°F.

THIS PARTICULAR BOILER HAS GIVEN TROUBLE-FREE SERVICE TO BRITISH USERS DURING THE LAST SIX YEARS

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1789

OBRIENS
'CALICO PRINTING'
DISCUSSES CROOKED WEFT

however be here faid, that the chief care is to keep the weft as much as poffible in the fame ftate as when woven, that is, in refpect to the direction of the threads ; the omiffion of which, even when work is folded to go for fale, is evident in many patterns. As for inftance, if a piece be calendered fo badly, that the threads lay all very obliquely acrofs the table, and the pattern be of a fquare fet kind, it muft be clear that if printed on in fuch a ftate, and in the courfe of the following proceffes the cloth gets into its original ftate, the work will appear juft in the fame oblique direction, as the fhoot of the cloth did when it lay on the table ; and inftead of the object being of a fquare kind, it will appear more like a diamond, which is almoft making a different pattern of it, and in the inftances of fmall fprigs or other fet objects, it muft greatly tend to throw them out of fhape and their proper diftances.

1960 The accepted answer to the problem

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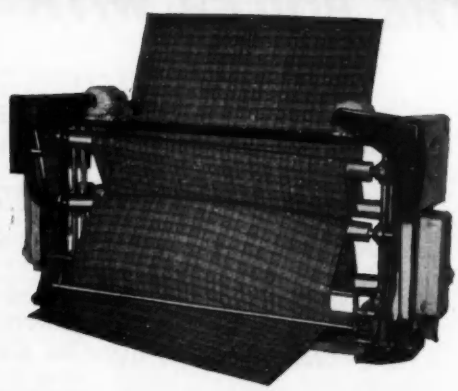

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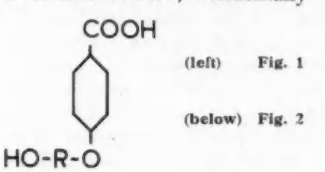
Progress in the Production and Uses of Man-Made Fibres

Points discussed include a new method for cyanoethylating cotton, developments in the materials used for sizing nylon yarns, also new methods for improving the heat- and alkali-stability of acrylic fibres, and performance details of the Svetema pad-roll dyeing plant

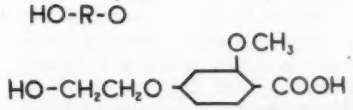
By B. C. M. DORSET

RECENT Japanese success in producing a new type of polyester fibre having a useful high softening temperature in addition to other desirable physical properties is especially interesting as showing how slowly ideas concerning the possibility of making a new fibre can mature and also how an idea emanating from one research worker taken in conjunction with another idea from elsewhere can together be made the basis of a new fibre manufacturing method. Thus some fifteen years ago British research (B.P. 604,985) revealed that hydroxycarboxylic acids (or their esters) conforming to the general formula shown in Fig. 1, in which R represents a grouping of the type $(CH_2)_x$ or $(CH_2)_2$—O where $x = 1$ or 2 and $z = 2$ or 3, could by heating at a high temperature (say 200°C.) be induced to self-polymerise to give linear fibre-forming polyesters having melting points usually below 210°C. and thus not so high as is generally desirable for a textile fibre; incidentally—the polyester fibre "Terylene" has a melting point of 260°C. An early American discovery (U.S.P. 2,686,198) has also shown that a closely related methoxy derivative of the above hydroxycarboxylic acid (or its methyl or ethyl ester) having the formula set out in Fig. 2 can, by similar heating, be changed to a fibre-forming polyester.



(left) Fig. 1

(below) Fig. 2



3 methoxy 4 (beta–hydroxethyoxy)–benzoic acid

Referring to particular cases it may be noted that para-(beta-hydroxyethoxy) benzoic acid having the formula given in Fig. 3 can give a

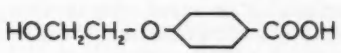


Fig. 3

polyester which can be readily spun into fibres having a tensile strength of 3·8 grams/den. and an extension at break of 38%, but these fibres are not satisfactory for textile purposes since they have a low wet strength and are susceptible to "molecular flow" when in contact with hot (60°C.) water. The 3-methoxy-4(beta-hydroxyethoxy)-benzoic acid of the formula already given gives a polyester which, in fibre form, has poor resistance to high temperatures and is not otherwise satisfactory from the textile viewpoint.

According to Japanese research (B.P. 813,239) if the above-mentioned two compounds are copolymerised in suitable proportions there an improved polyester is obtained which readily lends itself to melt-spinning with the production (including a "drawing" stage) of strong water-insensitive fibres having desirable high tensile strength and melting points. In general, it is better to copolymerise 2/8 to 6/4 mixtures of 3-methoxy-4(beta-hydroxyethoxy)-benzoic acid (A) and para-(beta-hydroxyethoxy)-benzoic acid (B) respectively since the fibres which can then be produced from the copolymers have the high melting points desired.

The data in Table 1 shows how the properties of the new fibres depend on the proportions of the copolymer ingredients used. It is evident from this data that variation of the proportions of 3-methoxy-4(beta-hydroxyethoxy) benzoic acid and para-(beta-hydroxyethoxy) benzoic acid used for preparation of the fibre-forming copolyester can readily be used as a means for controlling the essential physical properties of the resulting fibres.

Gamma Radiation Treatment

It may be recalled that in the past few years considerable attention has

Table 1

Fibre Property	Proportions of A to B in Copolyester Fibre					
	10/0	8/2	6/4	4/6	2/8	0/10
Melting point (of copolyester)	268°C.	253°C.	235°C.	218°C.	207°C.	215°C.
Tensile strength in g./denier*	2·4	2·8	3·5	5·0	5·0	3·8
% Extension at break* ..	10	20	25	30	35	38

* Refers to fibres drawn to 3 - 7 times their original length at 40°C.

been given to a particular method for modifying cotton and viscose rayon materials by treating them with acrylonitrile (CH_2CHCN) in the presence of caustic soda so that a small proportion of the hydroxyl groups of the cellulose become cyanoethylated—the cotton is thereby changed so that it is much more resistant to attack by micro-organisms during exposure to soil and weathering conditions and also to high temperatures while it at the same time acquires an affinity for acid wool and disperse dyes to which the cotton is normally inert. Such a method of modification is expensive and the chemical treatment involves the use of a special technique and equipment. It is, therefore, most interesting to note that this same modification can be produced by impregnating the cotton with a zinc chloride solution of acrylonitrile and then exposing it to gamma radiation emanating from cobalt 60—this discovery would appear to indicate a simpler and perhaps cheaper means for obtaining the modification of cotton so far possible only by means of the chemical procedure described above.

This new method for cyanoethylating cotton and which involves the etherification reaction set out in Fig. 4, can now be effected by a

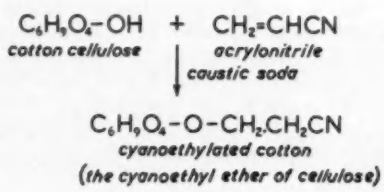


Fig. 4

treatment (Arthur, Demint, McSherry and Jurgens: J. Text. Res., 1959, **29**, 759) in which the cotton is first purified and then impregnated with an aqueous liquor containing 80% zinc chloride and 32% acrylonitrile followed by exposure to a dosage of gamma radiation up to 10 roentgens. The extent of combination of acrylonitrile with the cotton and the changes in strength and extensibility of the latter are governed by the dosage with gamma radiation as indicated by the data in Table 2. Most significant among the changes indicated is the increase of fibre extensibility at break—the breaking strength itself is not appreciably changed. The concentration of zinc chloride in the treating liquor influences the extent of fibre modification. For example, the acrylonitrile add-on can be doubled by raising the

Table 2

Dosage with Gamma Radiation	Acrylonitrile Add-on	Cotton Fibre Properties: Breaking Strength	Cotton Fibre Properties: Extension at Break
None	None	9·8 lbs.	10·2%
0·2%	4·5%	9·6 „	10·9%
0·3%	8·0%	8·6 „	9·6%
0·4%	14·0%	9·1 „	12·7%
0·6%	17·0%	9·3 „	15·6%
0·7%	23·0%	9·0 „	17·8%
0·8%	26·0%	9·5 „	16·6%
1·0%	25·0%	9·3 „	19·2%

concentration from 65% to 80% in applying 32% of acrylonitrile under comparable conditions. A somewhat similar result can be obtained in using 75% zinc chloride solutions containing 20% and 40% of acrylonitrile.

So far, it has not been completely established how the acrylonitrile becomes fixed within the cotton fibres under the influence of the gamma radiation. No doubt some acrylonitrile is simply polymerised to give highly inert polyacrylonitrile while the remainder will become chemically combined with the fibre in the ether form indicated above. But there is also the probability that long linear polymerised acrylonitrile molecules will take part in cellulose ether formation. The cyanoethylated cotton may contain two forms of cellulose cyanoethyl ethers as indicated in Fig. 5. Since

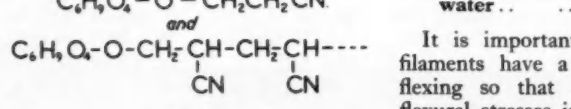


Fig. 5

polyacrylonitrile is soluble in N,N-dimethylformamide at room temperature and higher it is possible to extract any polyacrylonitrile not combined chemically with the cotton fibres. The data given above showing the acrylonitrile add-on after gamma radiation under progressively more severe conditions apply to cotton finally extracted with the polyacrylonitrile solvent.

Easy-Dyeing Polyacrylonitrile Synthetic Fibres

A recent Italian discovery (B.P. 813,013) is that cyanoethyl ethers of starch (obtained by reacting starch with acrylonitrile) can be usefully added to polyacrylonitrile spinning solutions so that the resulting fibres have a much increased affinity for acid dyes and also for those basic dyes which are normally applicable to acetate fibres. It is further claimed that owing to the presence of the cyanoethyl starch ether the spinning solution tends less to darken in colour while being prepared or being held during spinning at a high temperature and that the resulting fibres can be more easily drawn (stretched) in that stage of the manufacture which is employed to increase their tensile strength and produce an acceptable degree of extensibility. Much the same advantages are obtained with copolymers (instead of homopolymers) containing a high proportion of acrylonitrile. It has been established that it is unnecessary to add more than 10% of the cyanoethyl starch ether to the polyacryle.

In a typical procedure, a spinning solution is made by first dissolving 10 kg. of water-insoluble cyanoethyl starch ether in 400 kg. of dimethylformamide at 40 to 60°C. The resulting solution is then cooled before dispersing in it 90 kg. of polyacrylonitrile (mol. weight, 73,000) and 400 grams of titanium dioxide (to give a matt appearance). The spinning solution thus obtained is then heated to 100 - 120°C. and dry-spun at 80°C. The resulting filaments (in yarn form) are drawn to five times original length in steam at 150 to 180°C. and then stabilised in boiling water. Thereafter, the filaments are mechanically crimped so that their final properties are as follows:—

Tensile strength ..	**3·17 g./den.**
Extensibility	**22%**
Shrinkage in boiling water	**3 to 4%**

It is important to note that the filaments have a high resistance to flexing so that when subjected to flexural stresses in a testing machine they do not suffer breakage within the first 5 to 6 mins. whereas ordinarily spun filaments under the same testing conditions break within 15 to 20 secs. These new type fibres readily acquire an intense colour when dyed with Malachite Green or Setyl Violet B at the boil and the fastness properties of such colourings are excellent. The cyanoethyl starch ethers which can be used for improving polyacrylonitrile fibres are readily available commercially for sizing.

Sizing Nylon Yarns

Most of the difficulties associated with sizing nylon yarns can be traced to the strong hydrophobic properties of the fibres, which prevent them soaking up any aqueous sizing compositions applied; the applied size is liable to flaking-off. Polyacrylic acid is a commonly used nylon size but it is desirable to effect sizing at lower cost and at the same time to obtain an improvement in the abrasion resistance of the sized yarns. According to B.P. 815,830 these objects can be largely

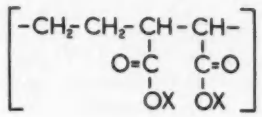


Fig. 6

formula A

achieved by making use of selected water-soluble ethylene-maleic interpolymers containing the recurring unit (Fig. 6) in their molecular structure: and in which one X is hydrogen and the other X is either hydrogen or a group derived from an alcohol (X - OH) which is aliphatic and may contain from 8 to 20 carbon atoms. It is necessary that this type of ethylene-maleic interpolymer should be in its water-soluble form and also that it should be in the free-acid form (an alkali-metal salt is liable to become undesirably tacky under humid conditions). To satisfy this condition the first formed interpolymer (in its anhydride form) should be treated with hot water or preferably be exposed to a highly humid atmosphere at 50 to 90°C. until a sufficient number of the anhydride groups have been converted into free carboxylic acid groups and the interpolymer thus be made readily soluble in water.

A convenient method for making ethylene-maleic interpolymers is to react the ethylene and the maleic anhydride in the presence of a solvent for the maleic anhydride (for example, benzene, toluene, etc.) and a free-radical-liberating catalyst (for example, benzoyl peroxide, tertiary butyl peroxide, etc.) at 45 to 80°C. under a pressure of about 500 lbs./sq. in. within a closed autoclave (a batchwise process) or while the reactants are being led through a tube (a continuous process). Since the solvent employed for the maleic anhydride is also a non-solvent for the resulting interpolymer the product of the polymerisation is a slurry consisting of fine particles of the interpolymer suspended in the solvent, say benzene. The interpolymer can be filtered off and then be treated with water or water vapour to hydrolyse the anhydrid groups to carboxylic acid groups. Interpolymerisation of ethylene and maleic anhydride with subsequent hydrolysis procedes in the manner shown in Fig. 7.

The following example illustrates how such interpolymerisation is actually carried out. An autoclave was charged with 1,600 c.c. of benzene, 200 g. of maleic anhydride and 2·56 g. of benzoyl peroxide. Then followed further charging with ethylene to a pressure of 600 lbs./sq. in. which was maintained during the subsequent interpolymerisation at 70°C. Interpolymerisation was deemed to have ceased when the pressure within the autoclave showed no tendency to drop. Excess of ethylene was then removed and the autoclave opened to secure the slurry of interpolymer which latter was filtered off and then dried in a vaccum oven at 110°C. for 20 hours. A practically theoretical yield of interpolymer was obtained and it gave a 1% solution in dimethylformamide having a spec. viscosity of 1·26 at 25°C.

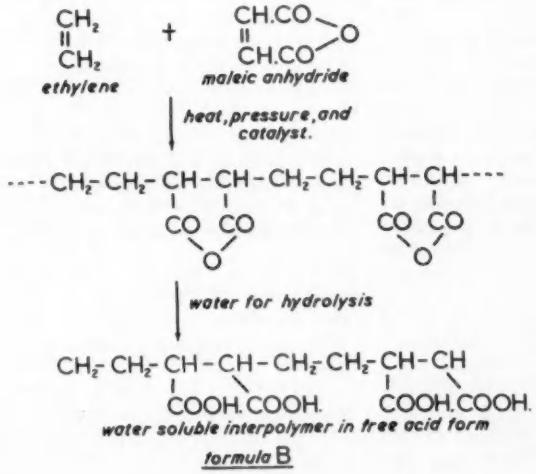
Thereafter the interpolymer was exposed in trays in a closed oven to a temperature of 70°C. and surrounding air of 70% R.H. for 7 hours and at the end of this period it was found that almost all the anhydride groups were hydrolysed to carboxylic acid groups so that the interpolymer was completely water-soluble and suitable for use in the sizing of nylon yarns. It may here be incidentally noted that it matters little what proportion of ethylene and maleic anhydride are brought together for interpolymerisation — the resulting interpolymer always has substantially one mole of ethylene combined with one mole of maleic anhydride. Since it is an important point that the new type of nylon size confers on the sized yarn a high degree of resistance to abrasion a test was carried out in which comparable nylon yarns were sized with 5 to 6% of two separately made ethylene-maleic anhydride interpolymers and also of a commercially available polyacrylic acid size as widely used, and then the abrasion resistances of the sized yarns were then compared by a standard technique with the results set out in Table 3.

Table 3

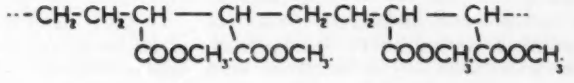
Abrasion Resistance

Rubbing Cycles in Abrasion Test ..	0	20	40	80
Sizing —				
Interpolymer of ethylene and maleic anhydride	8·8	8·8	9·2	8·4
ditto	8·8	8·4	8·6	8·5
Commercial polyacrylic acid	8·6	8·6	8·0	7·6

From the data in Table 3 it is seen that nylon sized with the new interpolymer sizes suffered practically no loss in abrasion throughout the entire test period of 80 cycles in the abrasion testing apparatus, whereas the nylon sized with polyacrylic acid resisted abrasion for 20 cycles and then showed progressively lower abrasion resistance. In general, the sizing of nylon yarn is simply effected by treating it with a solution containing sufficient of the interpolymer so that on drying there is left about 5% or less of the inter-



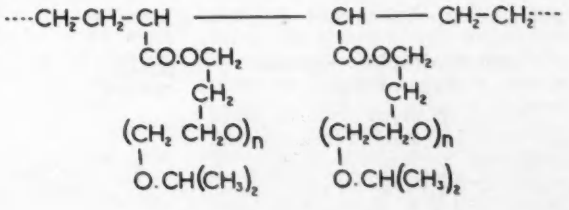
formula B



(above) Fig. 8

(left) Fig. 7

(below) Fig. 9



polymer on the yarn. It is an advantage of these sizing interpolymers that it is generally unnecessary to add to the sizing solution any adjuvant such as humectants, oils, and wetting agents. Under these conditions of sizing the nylon yarn is left so that in weaving and knitting no dusting or flaking-off of the size occurs—the adhesion between the ethylenemaleic anhydride interpolymer and the nylon fibres is exceptionally strong. Neither is it necessary to wax the sized nylon yarn as it rolls off the last drying cylinder—a further advantage.

So far reference has been made to hydrolysed ethylene-maleic anhydride interpolymers in which substantially all the anhydride groups have been converted into carboxylic acid groups as shown in formula *B* above (this corresponds to the general formula *A* in which one X is hydrogen and the other is also hydrogen). But it has been mentioned that one of these *X* groups may be derived from an aliphatic alcohol X - OH. So here it must be mentioned that some special nylon sizing agents of the same type can be produced by esterifying the ethylene-maleic anhydride interpolymers already described, say with methyl alcohol. Such a modified interpolymer has the formula shown in Fig. 8.

It is possible to use instead of methyl alcohol other related alcohols such as propyl and butyl alcohols but if higher molecular weight alcohols are employed then the water-solubility of the esterified interpolymer tends to be lowered unduly. However if it is desired to esterify with a higher alcohol which has this adverse effect it can be counteracted by using a higher alcohol which has been given water-solubilising groups, as for example, by reacting it with several ethylene oxide molecules. Thus the esterified interpolymer made with iso-propyl alcohol can be made more water-soluble by first treating the iso-propyl alcohol with ethylene oxide. The formula of such a interpolymer is given in Fig. 9. It is evident that there is considerable scope for preparing a large number of these new ethylene-maleic anhydride interpolymers so as to secure those required to meet special sizing requirements.

Less-Hydrophile Viscose Rayon Fibres

The way in which synthetic fibres such as nylon and "Terylene" lend themselves to the production of articles having wash-and-wear characteristics is due to the fact that such fibres are hydrophobic and so it is evident that if regenerated cellulose fibres such as viscose rayon are to compete in this field they will have to be made much less hydrophile than they are normally and if possible to be made hydrophobic. Research is now being conducted in the direction of discovering treatments by which viscose rayon can be thus modified and already some degree of success is being obtained. For instance, B.P. 817,294 discloses that by treating viscose rayon with selected epoxy compounds it has been found possible to reduce the water of imbibition of the rayon from the usual 98% to within the range of 45 to 69% which represents a considerable achievement when it is considered how highly hydrophile this type of rayon can be especially if it is not at some stage in its manufacture dried at a high temperature.

The treatment found effective consists of applying to the rayon a 2·5% aqueous solution of an agent containing at least two 2 : 3-epoxy-propyl groups and then heating the rayon preferably at a temperature approaching 140°C. for a few minutes (or for a longer period at a lower temperature) to induce combination between the agent and the fibres. It is most probable that the reaction involved results from etherification of the hydroxyl groups of the rayon cellulose by the epoxy compound. Since the free hydroxyl groups of cellulose give this its strong hydrophile characteristics it is evident that the etherification or suppression of these groups should make regenerated cellulose fibres less hydrophile.

If a simple epoxy compound be applied to cellulose the reaction shown in Fig. 10 will take place under suitable conditions. A somewhat similar but less clearly defined reaction will occur when the epoxy compound is also an amine derivative. The epoxy compounds envisaged in being useful for making regenerated cellulose fibres less hydrophile include tris (2 : 3-epoxy-propyl) amine, bis (2 : 3-epoxy-propyl) ethylamine, and N,N-bis (2 : 3-epoxy-propyl)-tetra (3-chloro-2-hydroxy-propyl) amine which can be prepared by methods described in B.P. 795,356.

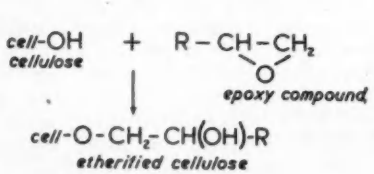


Fig. 10

For example, tris (2 : 3-epoxy-propyl) amine can be made by treating tris (3-chloro-2-hydroxy-propyl) amine with caustic soda. Tris (2 : 3-epoxy-propyl) amine has the formula shown in Fig. 11 in the treatment recommended, viscose rayon fibres are impregnated with a 2·5% aqueous solution of tris (2 : 3-epoxy-propyl) amine having a pH of 8 and are then dried and heated. The duration of the heating must be suitably correlated to the temperature used and the data obtained in Table 4 illustrate this

Table 4

Heating Conditions	Water of Imbibition of Treated Rayon Fibres
140°C. for 1 hour ..	44·6%
" ½ " ..	45·9%
" ¼ " ..	48·6%
" 5 mins. ..	52·4%
120°C. for 1 hour ..	46·9%
" 5 mins. ..	68·8%
100°C. for 1 hour ..	52·5%
" 5 mins. ..	58·8%
70°C. for 12 hours ..	52·5%
" 2 " ..	59·4%
Untreated rayon ..	98·0%

point. An important feature of such as treatment is that it does not materially discolour the fibres. Viscose rayon staple fibres which have not been dried since the spinning stage have a higher water of imbibition of about 113% yet these can be treated as described above and be made much less hydrophile. For example, by heating at 120°C. for 30 mins. the water of imbibition can be lowered to 56%.

Although it is essential for a fabric to be made of fibres having a low water of imbibition if it is to have drip-dry characteristics there is quite another aspect of this particular property which must come into consideration. Fabrics which have a low water of imbibition tend to crease less than those more strongly hydrophile. Also the fibres of which they are made tend to swell less when wetted. Thus to be able to make regenerated cellulose fibres less hydrophile, as measured by their water of imbibition, is an important step towards giving them wash-and-wear characteristics resistance to creasing and shrinkage and rapid drying). Such a change by itself may not be able to confer wash-and-

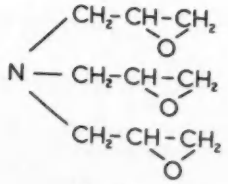


Fig. 11

wear characteristics but it can assist any other finishing treatment designed to produce the same characteristics. That this fact is appreciated seems to be evident from the continued research in this field.

Improving the Heat- and Alkali-Stability of Acrylic Fibres

It has been found that the incorporation of basic substances such as a vinylpyridine in fibre-forming polymers of acrylonitrile by blending or copolymerisation has a tendency to make the resulting fibres sensitive to heat and alkalis—this adverse effect has been particularly observed when the fibres are spun from concentrated thiocyanate solutions of the fibre-forming polymeric raw material. To remove this defect it has been proposed in B.P. 813,815 to treat the acrylic fibres (basified to give them improved dyeing properties) with solution containing a small proportion of sodium hexametaphosphate and a higher proportion of ortho-phosphoric acid. This treatment should be applied to the fibres at any stage following spinning (with or without stretching) but before drying, i.e., while the filaments are swollen. When acrylic fibres are produced in this way they more satisfactorily withstand alkaline scouring and heat treatments and in such treatments they resist discolouration.

Acrylic fibres of the basified and easy-dyeing type are today considerably more complex in their composition than when first introduced. This development arises from the need to overcome the difficult-dyeing characteristics of earlier types made almost entirely of polyacrylonitrile. Thus, to secure easy-dyeing properties it has become desirable not only to have (copolymerised or otherwise) in the fibre a basic substance such as a vinylpyridine but also a kind of distending agent so that the fibres are looser in structure than a straight 100% polyacrylonitrile fibre. It will thus be of interest to give the following details of the method of preparation of a modern acrylic fibre and also indicate how it can be improved by use of a phosphate treatment as indicated above.

Production of the acrylic fibre consists of two stages—the preparation of the fibre-forming copolymer and the conversion of this into fibres. The copolymer is formed in the following manner. First, equal weights of 2-vinylpyridine and acrylonitrile are copolymerised under pressure with the aid of 0·2% (calc. on the acrylonitrile) of azo-bis-iso-butyronitrile as a catalyst. In the resulting copolymer the nitrogen atom of the vinylpyridine component is in its tri-valent form but it is convenient now to make it penta-valent and this is achieved by quaternizing the copolymer by treatment (the copolymer is first dissolved in its own weight of a 75/25 mixture of dimethyl-formamide and methyl alcohol) with dimethyl sulphate. Then 50% aqueous solution of sodium thiocyanate is added to the quaternized product to precipitate the quaternized copolymer as its thiocyanate salt which is then filtered off and dissolved in 50% aqueous sodium thiocyanate solution to form a 12·5% solution (A) of the copolymer.

Meanwhile 90 parts of acrylonitrile and 10 parts of methyl acrylate are copolymerised by an emulsion method using an ammonium persulphate sodium meta-bisulphite redox catalyst. The resulting copolymer is dissolved in a mixture of 45 parts of water and 10 parts of methyl alcohol to form a 15% solution (B). The spinning solution is then made by mixing 10 parts of solution (A) with 90 parts of solution (B). This is then extruded into a 10% aqueous solution of sodium thiocyanate and the resulting fibres in tow form are washed in hot water, stretched to 17 times their original length in steam, and then passed for 10 mins. through a bath at 60°C. containing in each 100 c.c. some 3·5 g. of ortho-phosphoric acid (sp. gr. 1·75) and 0·75 g. of sodium hexametaphosphate. The tow of fibres is then washed in cold water and dried. The resulting fibres have a good affinity for acid wool dyes and they notably possess good stability towards alkalis and high temperatures.

Firm-Handling Crimped Synthetic Threads

A known method for imparting a crimp to synthetic fibre threads including those made with polyamide and polyester fibres is that of temporarily twisting the thread by means of a false twisting device and then subjecting it in this twisted condition to a steaming or a dry heat treatment with the object of setting the thread in this state. However it is often the case that the thread so produced has a very soft or flaccid handle unsuitable for some kinds of woven or knitted fabrics which are required to have a somewhat rougher and firmer handle.

It is now found that a firmer handling thread of the "stretch" type can be made by a similar process to that described above but with the addition of a rapid high temperature treatment (B.P. 815,176) of about 3 secs. duration so that the surface of the fibres undergoes incipient softening to cause the fibres to adhere partially to each other. Preferably the heat treatment is carried out for a period of between 0·4 and 3 secs. at a temperature lying between 30 and 3°C. below the melting point of the fibres. The process gives good effects when using polyamide thread spun from polyhexamethylene adipamide (nylon) if the thread is exposed to a heat treatment between 228 and 245°C. If the polyamide thread is spun from a ε-caprolactam polymer (Perlon) a lower temperature of 185 to 195°C. should be used but with polyester thread ("Terylene") the higher temperature of 235 to 250°C. is required. It is found advantageous to draw the thread from the false twister at a 5 to 15% slower rate than that at which it enters it.

For producing polyhexamethylene adipamide (nylon) threads of the above type the following method of processing is recommended. Starting with a thread of 70 den. 23 fil. and having a $\frac{z}{a}$ twist of 30 turns/metre, this is first temporarily further twisted to 2,800 turns by the false twisting device and then passed through the heating device where it is exposed for 1·3 secs. to the action of hot air at 238°C. and then cooled. In passing through these treatments the thread is led in at 52 metres/min. and drawn out at 46 metres/min. thus allowing a length contraction of about 8%. If it is then required to produce a doubled thread it is necessary to prepare two threads as described each twisted with 2,800 turns/metre but one with "*S*" and the other with "*Z*" twist. These can then be twisted together with 100 turns/metre of "*S*" twist so that a uniformly bulked thread suitable for weaving or knitting to give fabrics having a very even strong crimp and relatively hard hand results.

In processing a polyethylene terephthalate thread (40 den. 34 fil.) having 33 turns/metre of "*Z*" twist this is temporarily given 3,680 turns/metre of *s* or z twist by means of the false twister and then passed for 1·6 secs. through the heater supplied with hot air at 235°C. and is then cooled; the thread length contraction allowed in passing through the false twister is 10%. If two such threads having "*S*" and "*Z*" twist are doubled with 100 turns/metre of "*S*" twist there results a thread which gives woven and knitted fabrics having a relatively firm handle with outstanding

Lighting-3

Data Sheet No. 7 dealt with some actual applications of factory lighting. Further applications are given here.

Drawing Offices

It is fair to say that in no part of a factory is good lighting more important than in the drawing office. The draughtsman's task is extremely exacting and unless the illumination is up to required standards, mistakes, loss of time and greater fatigue will result.

The essential requirements are:

High value of illumination
(*minimum of 30 foot-candles on the boards*)
Absence of shadows
Absence of reflection

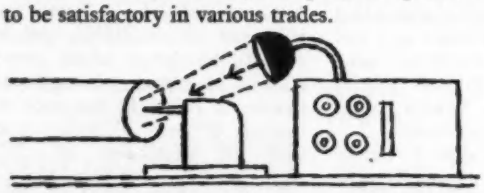
One of the major problems is the reflection of the light sources by shiny tracing paper, instruments, set-squares, etc., and particularly by the extra-hard pencil leads often used. Another problem is that caused by the shadows ahead of T-squares and by the variety of angles at which drawing boards are set.

Fluorescent lighting is particularly suitable because of its comparative freedom from shadow, its natural colour and because it can be localised with respect to drawing boards to avoid reflections while at the same time giving enough light upward and sideways to satisfy the general lighting requirements of the office.

A lighting solution which has been successfully employed for tracing is to light from beneath and through the paper which is fixed on to a translucent panel, thus eliminating the problems of shadow and reflection.

Machine Shops

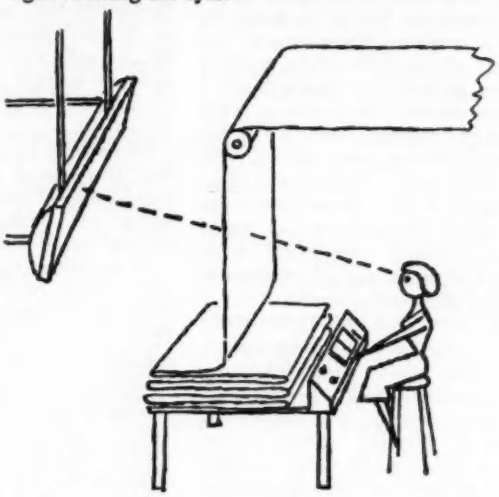
The problems of machine-shop lighting vary so widely that it is impossible to lay down rigid rules which are applicable to all types of machine. Much of the design of such lighting systems must therefore be a matter of individual application. Certain maxims, however, have proved in practice to be satisfactory in various trades.



There is a strong case for the provision of local lighting on many machines to enable the direction of light to be varied to suit the work, or to boost the illumination for fine work.

In shops employing certain machine tools, particularly circular saws, the possibility of stroboscopic effects can be avoided by splitting lamps among the phases of a three-phase supply or by using twin lamp fittings with a split-phase circuit.

Where safety goggles are used, extra illumination should be provided to compensate for the reduced light reaching the eyes.



Silhouette inspection of fabrics or profiles can often be used to advantage by placing a light source behind the material to be inspected — on the lines of the back-lighting already referred to for tracing in the drawing offices.

In general, machine-shop lighting is essentially an empirical science, based largely on a combination of general and local lighting, which offers immense scope for ingenuity.

Outside Lighting

The outside precincts of a factory are often much neglected. No special rules can be suggested for lighting these areas, but speed, efficiency and safety are all dependent on adequate outside illumination during the hours of darkness.

For further information, get in touch with your Electricity Board or write direct to the Electrical Development Association, 2 Savoy Hill, London, W.C.2. Telephone: TEMple Bar 9434.

Excellent reference books on electricity and productivity (8/6 each or 9/- post free) are available—"Lighting in Industry" is an example.

E.D.A. also have available on free loan in the United Kingdom a series of films on the industrial uses of electricity, including one on industrial lighting. Ask for a catalogue.

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crimp. It has been observed that during the short heat treatment only a proportion of the fibres become stuck to each other and that because the treatment is so short this does not reduce to any substantial degree the crimped effect resulting from the false twist.

Pad-Roll Dyeing Machine

An interesting report has recently been published by Percarpio and Lesh (Amer. Dyes. Rep., 1959, **48**, No. 15, 41) on the performance in an American dyeing plant of the Svetema pad-roll dyeing plant (made in Sweden and invented by Bertil Mellbin) which is especially designed for the continuous and economical dyeing of long runs of woven fabric of many types including those made with synthetic fibres. The report is generally favourable but it refers to some of the difficulties encountered.

The essential features of the dyeing plant are novel. The plant consists of a padding machine of a type which usefully requires but a small amount of dye liquor (4 galls.) to fill the dye liquor trough (difficulties associated with uneven dye absorption due to the fabric having substantive affinity for the dye are thus minimised), a chamber for heating the padded fabric, and one or more complete movable chambers for containing the fabric batched on a roller so that this can be maintained rotating and at a constant high temperature. In operation, dry fabric is led in open width through the padding mangle (the dye liquor may be at any desired temperature), and then through the heating chamber where infra-red lamps raise its temperature to that which is maintained in the batching chamber, and it is then led into the batching chamber where upwards of 7,000 yds. (according to the quality of fabric) is batched on one constantly rotating roller. This batching chamber is heat insulated and contains heating units so that the fabric can be held at any particular temperature and also at a constant high humidity. Under these conditions fabric can be padded at the rate of say 80 yds./min. with a dye liquor which laboratory trials have shown will, on exhaustion, give the required shade, and this exhaustion can then be promoted by maintaining suitable conditions of time, temperature, and humidity in the batching chamber. Since several complete batching chambers are normally available the padding machine can be kept working without a stop a very high output of dyed fabric can be obtained. It is reported that two men are able to handle the entire operation and so in a 12-hour day secure a total output of 35,000 yds.—this would require the use of five movable batching chambers.

Among the many favourable aspects of this dyeing plant apart from the high output and low labour costs just mentioned is the fact that the conditions within the batching chamber are so favourable to dye absorption that it is usual to secure a 90% dye exhaustion of the dye liquor present in the fabric as it leaves the padding machine and this coupled with the small volume of liquor left in the padding machine at the end of the operation accounts for a very low dye wastage. A second advantage is that the fabric is handled with but little length tension. This not only avoids undue distortion and stretching of the fabric but it is favourable to a good dye liquor pick-up and the penetration of this liquor through fabrics which may be very tightly woven.

It is an interesting feature of this method of dyeing that fabrics padded with different dye liquors can be batched on the same batching roller if this is desired since there is scarcely any bleeding of dye liquor from one part of the batch to another part. Another feature is that the batching roller is usually about 2 ft. in diameter and that when filled with padded fabric (say 7,000 yds.) the diameter of the whole batch may be about 6 ft. (with lightweight fabric the total yardage may be as high as 12,000). Practically all the conditions of padding. heating, and batching are automatically governed. The composition of the dye liquor has to be determined by laboratory trials and it is somewhat unfortunate that these are tedious and cannot be unduly hastened. The correction of faulty dyeings (if any) can also involve much time and labour.

A consideration of the dyeing process suggests that the two most important stages—(*a*) attraction of dye to the fibre surfaces and (*b*) passage of dye by diffusion from the fibre surfaces to the fibre interior—differ essentially as regards their rapidity. The first takes place rapidly and the latter quite slowly. In ordinary dyeing procedures the output of dyed fabric from any particular dyeing machine is usually low because it is governed by the low rate of dye diffusion. The Svetema dyeing plant now being considered separates the two processes just mentioned and in particular it uses multiple units (batching chambers) for the dye diffusion stage so that this does not restrict the output of the dyeing machine. This appears to be a very sensible development in dyeing practice.

Change of Ownership

Timken Roller Bearing Co. and Fafnir Bearing Co. of New Britain, Connecticut, U.S.A., have announced that an agreement will shortly be concluded by which a recently formed subsidiary of the latter will purchase the business of Fischer Bearings Co. Ltd., a Timken subsidiary. The sale of Fischer, until recently owned by British Timken Ltd., results from the Timken decision to confine their interest to the manufacture of tapered roller bearings. They will, however, continue for the present, to distribute FBC. bearings for replacement purposes in Britain, through their subsidiary Timken stockists, and in Australia, South Africa and Canada, through their branches in those countries. It is intended that Fafnir's British products will be marketed under the Fafnir name and that the business will be expanded to meet the anticipated increase in demand in both British and world markets.

* * *

Flexible Storage Arrangements

When William Hollins and Co. Ltd., textile manufacturers and makers of the "Viyella" range of fabrics and clothing, installed extra shelving to store boxes of finished garments at their Nottingham warehouses, their future needs were not precisely known. The racking had to be adaptable enough to enable considerable modification or extension, should the need arise. Using Dexion slotted angle, 6 ft. high storage units divided into 3 ft. square compartments were erected in such a way that extra shelves could be added on top with a minimum of time and trouble.

Now the firm has decided that, for ease of handling, the Dexion will be altered to make more compartments, each being only a quarter the area. Garments are to be stored loose in hardboard trays instead of in boxed quantities. Dexion is extensively used in the textile field in Britain and the Continent because its versatility enables it to be modified to suit the industry's changing requirements.

* * *

Cotton Prices in Uganda

From Kampala, Uganda, Barclays Bank D.C.O. reports that at the first December auction by the Lint Marketing Board, cotton prices rose by an average of some 23 cents/lb. and by the middle of the month had risen another 10 cents/lb. The rapid rise in the prices per lb. lint for first grade cotton is shown by the fact that on November 24, 1959, highest average, lowest average and overall average prices were 227.31, 204.50 and 221.61 cents respectively and on December 15 they were 271.25, 240.00 and 256.89 cents respectively. During the same period, the Bank adds, 7,600 bales of second grade cotton were also sold at prices ranging from 173.25 to 163.50 cents/lb.

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Textile Trade and Prospects

Linen Trade Review

Apart from the problem of raw material supply the outlook for 1960 is distinctly brighter than in recent years. Coinciding with the cessation of home flax production the decline by approximately half during the last four years in the area under cultivation in West Europe, and the reduction of fibre exports from the U.S.S.R., has created a critical situation. So far as the British manufacturing industry is concerned the problem has been largely its own making, due to neglect in post-war years of the domestic flax growing industry, which declined from a peak acreage of 124,500 in 1944 to less than 50 in 1959. The reason, ample supplies of imported fibre at a competitive price, and more easily processed.

The question of home grown versus imported flax has received so much publicity in the past that the findings—and more important still—the results of experience, should be familiar to all in the industry today. The technical and economic advantages associated with imported fibre have long been recognised, as also the fact that an adequate domestic supply acts as a price stabiliser in world markets in which the British linen industry is the main buyer. Neglect of the latter factor in recent years has brought about the unfortunate position in which it is completely dependent on overseas sources, and is a prey to the uncertainties and risks that such a position presents. Among these are sudden stoppage of supply, as occurred when U.S.S.R. exports ceased in 1937, and price exploitation, evidenced on more than one occasion by West European suppliers in recent years.

The announcement that the N. Ireland Ministry of Agriculture will guarantee prices for 1960 crop home grown fibre at 10s. per stone above those of the 1958 crop—the last crop for which the price was guaranteed—and that the Flax Spinners' Association has undertaken that its members will purchase the fibre from the entire crop of dam retted flax on agreed terms and conditions, offers some hope that a nucleus domestic supply will be restored, which could be expanded with further inducement. The rates are:—

Grade	Hand Scutched Per stone	Machine Scutched Per stone
1	41s. 0d.	42s. 6d.
2	39s. 6d.	41s. 0d.
3	38s. 0d.	39s. 6d.
4	36s. 6d.	38s.0d.
5	35s. 0d.	36s. 6d.
6	33s. 6d.	34s. 0d.
Rescutched tows.	Grade 1	£104 per ton
	" 2	£92 " "
	" 3	£74 " "

The above prices are similar to the guaranteed rates for 1956 crop fibre, when the area grown was approximately 8,500 acres. Labour costs, which constitute a very considerable part of the all-in cost of production have advanced considerably since 1956, so that the prices are less attractive than then.

The whole problem of flax supplies requires to be examined against the wider background of demand and supply within the textile industry as a whole. Available statistics indicate a progressive decline in world demand for linen manufactures in favour of those of competitive fibres. This is borne out by the contraction in total productive capacity, and the diversion of an increasing number of spindles and looms within the industry to processing man-made fibres and yarns. To what extent this is due to economic causes, and how much to consumer appeal, should emerge from the programme of market research now being carried out by the Irish Linen Guild. The findings are essential for drawing up any long term plan for domestic flax production.

The success achieved by the Guild under its recently appointed Director of Publicity in stimulating consumer interest through its well-planned advertising campaign to provide "the right article at the right price, in the right place at the right time" suggests the need for a "Director of Productivity" to ensure this is always available. Rapidly changing consumer interests and increasing competition of rival textiles demand comparable vision and flexibility in production, which can only be made effective by close liason between those who control production and those who study, and are also in a position to influence consumer interests.

Encouraging Outlook for Wool

The New Year opened cheerfully for the world wool industry. World consumption of wool in the chief manufacturing countries during 1959 was about 16% more than in the corresponding period of 1958, the rate of improvement showing considerable variation between individual countries. The U.K.—the largest wool using country in the world—registered an improvement of about 20%. In Continental Europe, the increases in France, West Germany and Italy, ranged from 3 to 7% over the larger part of 1959. Largest proportionate improvements were in the U.S.A. and Japan, with increases over 1958 of 39 and 42% respectively. When figures for the complete year are available, it seems probable that world wool consumption during 1959 will reach one of the highest totals of the present decade and one which will be among the highest since the war. In a considerable measure, this represents recovery from the sub-normal demand of the previous year in the larger manufacturing countries.

There is encouraging evidence of a steadily expanding call for wool from China, Russia and certain Eastern European countries. China is among the countries importing increasing quantities of wool in partly processed form—such as tops—from older-established manufacturing countries. The U.K., largest exporter of tops, is virtually assured of setting up a post-war top export record in 1959. Improvement in world wool consumption has brought about an increased demand and better prices for the wool production of the Commonwealth. During the first half of the selling season, i.e. to the end of December, Australia alone had disposed of no fewer than 2,400,000 bales, the largest quantity ever sold in a comparable period. It represents approximately half of the current season's clip. Increased disposals were also recorded by New Zealand and South Africa, and prices in all markets showed a hardening trend towards the close of the year.

Mr. J. S. Gale, president of the National Council of Wool Selling Brokers of Australia, recently announced an extension of the Australian wool selling season "to cover all 12 months of the year." This, he said, had been arranged because Australia's clip was continually growing and progressively larger weights of wool were passing through the auctions. In the present season Australia would market the largest clip in her history; exceeding the record 4,867,000 bales clip of 1956-57.

Details of the extended selling programme have not yet been received in this country, but Mr. W. Wilkinson, president of the British Wool Federation, states that that organisation was lately advised of Australian plans which had been agreed in principle. These provided for one week's longer break in Australian selling at Christmas and Easter, and a shortened between-seasons interval which would extend from approximately mid-July to late August; the new system to be given a trial commencing March, 1960. "This extension," he said, "will be welcomed by most buyers not only in this but many other countries, and will bridge a gap which has always been a problem to the industry."

Reviewing wool sales since the opening of the season, Mr. G. A. Duncan, chairman of the New Zealand Wool Commission, said in Wellington that the overall price up to the end of last year was about 45d. per lb., 11¼d. higher than the average for the same period last season. Referring to prospects for the remainder of the season, Mr. Duncan said that although some uncertainty existed about present prices, mill activity was reported as being well maintained, and retail sales good. He added: "The U.K., France and the U.S., our most prominent users, have not yet operated directly as freely as during the corresponding period of last season."

Jute Fibre, Yarn and Cloth

The U.K. jute industry started 1960 on a happy note. Spinners had already secured large quantities of raw material before prices advanced. During the first six months of the season registered sales of jute to the U.K. amounted to 541,674 bales, or approximately 72% of the annual consumption of mills in Dundee and district. To this has to be added a substantial carry over at the beginning of the season as during the previous 12 months Dundee spinners secured at least 10% more raw material than they consumed.

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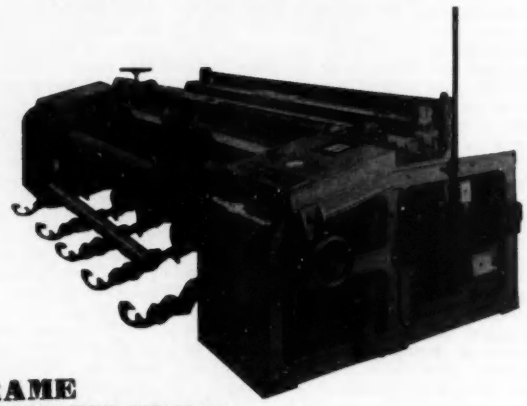
HYDRAULIC BEAMER

Lockheed Hydraulics enable constant pressure to be applied to beam rollers, from nothing to 1,000 lbs. per square inch, each side controlled independently. Constant Peripheral Beaming Speed throughout entire range of beam, from 6" diam. barrel to 36" diam. flange, at three different speeds. Totally enclosed oil immersed Constant Speed H-Gear Unit. Warp Length guaranteed. Machine automatically cuts out at any pre-set yardage for any number of beams, until re-set.



Tube frame threaded with the spool in its spring holders: eliminates four operations (patents pending). Needles are brought forward by simple foot operated switch, leaving operatives' hands free to attend to interrupted ends and return to thread by the same operation. Tube frames can be threaded as fast as removed from the chain, thus facilitating immediate return to their last position in the chain. All needles have rounded crochet hook ends, preventing yarn damage and enabling smoother threading. All spool end strive difficulties overcome enabling, 100% threading even if strive is as much as 1" by our new full length comb. By fitting side supports the standard 4/4 machine can thread 2/4 to 16/4 Tube frames, or a machine can be supplied 12/4 in width. Tube Frame automatically clamped eliminating still a further hand operation.

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Raw jute has become much dearer in Pakistan with little sight so far of any weakening in the position. E.P.C. values have increased steadily for all grades.

In the last quarter of 1959 E.P.C. value of cuttings advanced rapidly. At the end of September, the E.P.C. price of N.C. was £25 per ton now it is £45 and in some cases up to £50 being quoted. This sudden increase was due to large purchases by India from Pakistan. Not long ago cuttings were a drag on the market but the position has completely changed now and supplies are difficult to obtain. This dearer price was reflected in two increases in prices of rove yarns in the U.K. during December.

Although Dundee spinners are holding large stocks of raw material the same does not apply to other consuming countries. Most Continental countries have had to continue purchasing on the rising market and some high prices have been paid. Likewise Poland and Russia are still securing their needs from the present crop. Since prices became dearer, Dundee spinners have confined buying to spot and afloat parcels.

The outlook is rather obscure. Both the Pakistani and Indian jute crops have not given the yield of fibre expected and there may be a shortage before the end of the season. India has now ceased to allow exportation of raw jute from her crop as she does not have sufficient to meet her own requirements. This fact is not only due to a smaller outturn but to increased production by her mills.

During the past month prices of jute have increased steadily with Mill Firsts now lowest at £116, Mill Lightnings at £101, Mill Hearts at £90 10s. and grade Hearts at £76, c.i.f. U.K., for Jan./Feb. shipment. Grade Tossa-2/3 ranges from £114 10s. and grade Tossa-4 from £100 with Continental Tossa-2/3 at £91. Crack Daisee-2/3 is scarce with small parcels available at £98 and grade Daisee-2/3 at £90, Jan./Feb. shipment. Many shippers have remained out of the market for periods during the past month and this has made the position irregular with offers of fibre scarce at times.

The second estimate of the area under jute cultivation in Pakistan for the year 1959-60 is 1,375,000 acres against 1,528,000 acres in the corresponding estimate of last year. This decrease in area is due to the indifferent attitude of the growers in taking out licences to grow jute as a result of the very low prices prevailing during last season. The outturn of the present crop is estimated at 5,363,000 bales compared with 6,001,000 bales from the previous crop in Pakistan.

Demand for yarns and cloth at Dundee has been good. Most producers have orders in hand to keep them fully employed during the next three months. The business placed covers all descriptions of yarns and goods and the heavy end of the trade has also experienced their share of demand. The Wide cloths for carpet backing are very difficult. The carpet trade has been taking regular deliveries of yarns with every indication that this will continue well into 1960. Production in Dundee is at a high level.

Although it was necessary to raise yarn and cloth prices during December because of the dearer raw material market, this did not halt business to any extent. Business continued to be placed at the higher level of values because with producers being well booked, consumers had to take into consideration the delivery position.

The Calcutta goods market has also become much dearer due to the rise in raw material costs. Prices touched their highest levels at the end of December but since then there has been some reaction. U.K. buyers did not follow this rise in prices and little movement took place here during the past month. Quotations are now at 64s. 5d. for 10 oz. 40 in., and at 48s. 5d. for 7¼ oz. with 11 oz. 45 in. at 70s. 3d. per 100 yds., f.o.b. Calcutta for January shipment. B twills were at 170s. 6d. January.

Cotton Problems and Future

General conditions at the beginning of the year are better than for a long time, in terms of yarn and cloth inquiry, but in certain other respects the position could hardly be more dismal. The industry's wanton scrapping of such a large number of spindles and looms reflects all too clearly the excessively generous attitude of the Government in promising so much public money to remove what it might have considered a nuisance. The long queue of firms and directors, which formed almost over-night, revealed in stark reality the extent of the *interest* in the industry's future. It is a shameful reflection of our times to see share values rise in the anticipation of the returns to be gained by jumping on to this "scrapping band-wagon." This is not the only undesirable factor. It is a well-known fact, that immediately any "plan" of any kind is mooted, events begin to move in an equal and opposite way. The promise of compensation for scrapping was attended with exactly this same technique. The quick announcements of firms' deciding to go out of business at once resulted in a rapid lengthening of order books, rises in yarn prices, and many manufacturers milling around in their anxiety to find fresh sources of yarn supply. The reorganisation scheme was formulated at the onset to completely eliminate these undesirable characteristics. Although a more compact industry was undoubtedly needed, the methods of achieving it hardly bear examination. In addition to the loss of skilled operatives—many of whom will not accept shift working—there is a more alarming loss of first-class men in managerial and technical grades. A large proportion of these after giving of their utmost to the industry now find themselves redundant at an age which makes it extremely difficult for them to get posts similar to those they have lost. In certain cases staff pension schemes have also become a hollow mockery with some people only receiving on surrender only a fraction of what they have paid in contributions. There is certainly much more that the Government should have considered before launching this chaotic scheme. The cotton textile industry has been reduced to such a degree that any threat of world crisis would inevitably result in the U.K. suffering an acute shortage of cotton yarns and cloths.

In recent weeks the volume of inquiry has covered every kind and quality of single and folded yarns. At the moment raw material supplies give little cause for concern but some spinners, already heavily committed, refuse to accept orders on a long-term basis. Most of the business carried through has been on home trade account, with the bulk in standard weaving qualities on ring beam, cop, cone and cheese. All medium counts are in good request including single and folded hosiery specialities. Coarse yarns and condenser types are keenly sought and, at the other end of the scale, fine Bolton-type combed mule doubling wefts are in excellent demand. Novelty and blended qualities are eagerly snapped up.

In cloth, the slightly quieter tone over Christmas was followed by a spate of buying activity. Orders have been plentiful but only in a few instances have very large single orders been noted; most business has been centred around an extremely wide range of moderate-sized orders. Dress goods in woven and printed designs have been well supported and furnishing fabrics in dobby and jacquard styles in traditional and contemporary patterns have found ready buyers. More business has also been put through in certain types of industrial cloths.

I.C.I. Acrylonitrile Plant

At the beginning of December, trials of the I.C.I. General Chemicals Division's acrylonitrile plant at Cassel Works, Billingham, were successfully completed. This is an important development for British manufacturers of synthetic rubber copolymers and acrylic textile fibres, as the plant is said to have adequate capacity to meet all foreseeable home demands. The major outlet will be for acrylic fibres but there is an expanding demand for the manufacture of high impact strength resins. I.C.I. will itself use some of the output for its "Butakon" range of butadiene/acrylonitrile synthetic rubbers. These possess high resistance to oil, heat, sunlight and abrasion.

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New Flax Process

A new yarn-dyeing technique employed by Francis Webster and Sons Ltd., Alma Works, Arbroath, involves the use of acids instead of alkaline agents normally required for dyeing cellulose materials. The process is thought to be the first of its kind on flax yarns in Britain. A bright turquoise shade with high light and wet fastness has been achieved. The yarn will be woven into "Websterweave" linen tarpaulin canvas.

• • •

U.K. Carpet Company to Build Australian Factory

Brintons Ltd., wool carpet manufacturers of Kidderminster, have purchased a site at Geelong, Victoria, from the Australian State Lands Department. As one of several British carpet firms that have established factories in Australia they plan to build a carpet factory on the site.

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Higher Wages for Jute Workers

An increase of 3¾% on minimum rates was announced following a recent meeting of the Jute Wages Council in Dundee. The new minimum rate will be 150s. 3d. for adult male operatives and 103s. 3d. for adult females per 45-hour week, an increase of 5s. 5d. and 3s. 9d. respectively. Few of the 17,000 jute workers are on minimum rates and the increase will also be applied to other operative rates. The award means an addition of approximately £217,000 to the annual wage bill of the industry.

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STANDARD SINTOX ceramic thread guides save expense and give indefinite life.

This is one of the Cooke Creels at the Melbourne, Derbyshire factory of Thomas Haimes and Company Limited. For the processing of nylon yarn STANDARD SINTOX thread guides have been adopted.

The Creel takes 2,368 eyelets and 672 tubes. Whereas the cost of fitting this Creel with special SINTOX guides would have been £119, the adoption of items from the SINTOX STANDARD RANGE has meant a 55% reduction in expenditure . . . and SINTOX never wears out.

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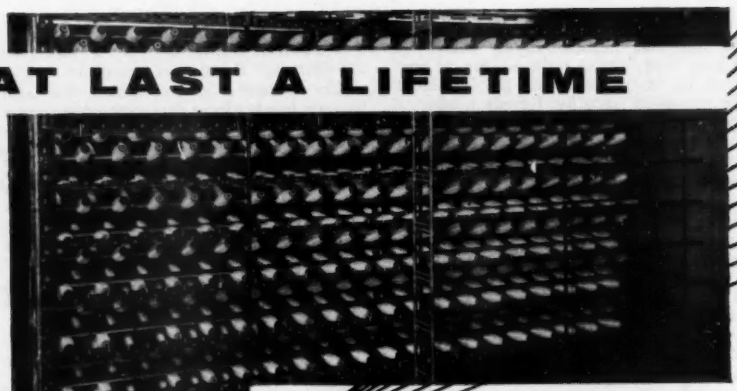

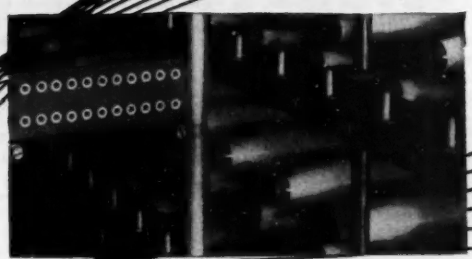

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Notes and News

Scotchgard Finish for Rainwear Fabrics

Silver Springs Bleaching and Dyeing Co. Ltd., who have successfully applied the Scotchgard finish to cotton fabrics, have processed a considerable yardage for the rainwear trade. During the past twelve months extensive "wearer trials" of rainwear, treated with the Starsylene Scotchgard finish, have been carried out under all conditions and have proved very successful. Development and production experience has enabled Silver Springs to build up a complete range of fibres and fabrics to which this finish can be applied. Scotchgard is the registered trade name of a finish resulting from the application of a fluorochemical, manufactured and imported by the Minnestota Mining and Manufacturing Co. Ltd., which provides treated fabrics with resistance to water, oil and dry soil; the effect is also stated to be resistant to repeated dry cleanings.

The finish has many applications. In rainwear, its water repellancy is claimed to be at least equal to any of the showerproof finishes on the market and independent laboratory tests are reported to have given vastly superior Bundesmann results. Since the true value of a raincoat can only be shown in wear, it is pointed out that the results of recent "wearer trials" are even more impressive. Dry soil resistance does increase the life of the garment but as light shades of cotton rainwear are in favour even a treated cloth may show signs of soiling. However, dry cleaning can be carried out without, it is said, serious detraction from the properties, thus saving the cost of reproofing.

The finish may also be applied to suitings and, although few people require a showerproof dress or suit, the protection against oil and water borne stains is of considerable value. Concerning furnishing and upholstery fabrics, it is said that complete resistance to all types of staining makes it unnecessary to cover new furniture. If loose covers are required for a changing colour scheme these, if treated, will have a longer working life.

Stains may result from oil/water substances being forced into porous fabrics but these, it is emphasised, may be removed with normal household solvent cleaners without leaving the "tell-tale" halo. Full details of Starsylene Scotchgard fabric finishes may be obtained from Silver Springs Bleaching and Dyeing Co. Ltd., Timbersbrook, Congleton, Cheshire.

• • •

New Fibre

Du Pont Company has announced plans for the commercial production of a new textile fibre—"Lycra" spandex fibre. It is an elastomeric fibre which stretches and snaps back into place like rubber and will be manufactured at Waynesboro, Virginia, on the site where Du Pont now makes "Acele" acetate yarn and "Orlon" acrylic fibre. Claimed to be stronger and more durable than conventional elastic thread, it weighs a third less and is reported to give longer wear, with two to three times as much restraining power. While its major application initially will be foundation garments, its potential extends to virtually every category of textiles. It has been evaluated in surgical stockings and swim wear. Surgical hosiery made of "Lycra" spandex fibre may be made to resemble service-weight nylons. The seventh textile fibre to be developed by Du Pont, "Lycra" is reported to require more complex chemical reactions than any of the company's other synthetic fibres.

The initial installation in Waynesboro to produce "Lycra" spandex fibre is scheduled for completion by the third quarter of 1960. Until the unit is in operation, "Lycra" will remain in limited supply since present production facilities are not much greater than the laboratory equipment which produced the first sample for market evaluation. In mono-filament yarn "Lycra" spandex fibre is inherently white. Fabrics containing it can be dyed as a piece, as opposed to dyeing the fibres before weaving. During the past year and a half, "Lycra" has been tested extensively by the foundation garment industry.

Du Pont report that foundation garments in three fabric types—warp stretch leno, weft stretch leno, and power net, were washed 50 times in automatic washing machines at 140°F., using a standard household detergent. Each washing was followed by drying in an electrically-operated home tumble-dryer at 180°F. One group of the three fabric types was made with conventional elastic yarns, the other with "Lycra." Next, the fabrics were stretched 30% of their relaxed dimension, and their restraining power was measured. Then they were flexed repeatedly. After ten thousand flex-cycles, the conventional warp stretch leno had lost 16% of its restraining power, compared to 10% for the one containing "Lycra." In the filling stretch leno, the conventional elastic fabric was incapable of being flexed after five thousand cycles, while the fabric of "Lycra" was in good condition after ten thousand cycles. In the power net comparison, the sample with "Lycra" was in good condition after ten thousand flexings, while the rubber control fabric failed after five thousand.

• • •

"Acrilan" Staple in Colours

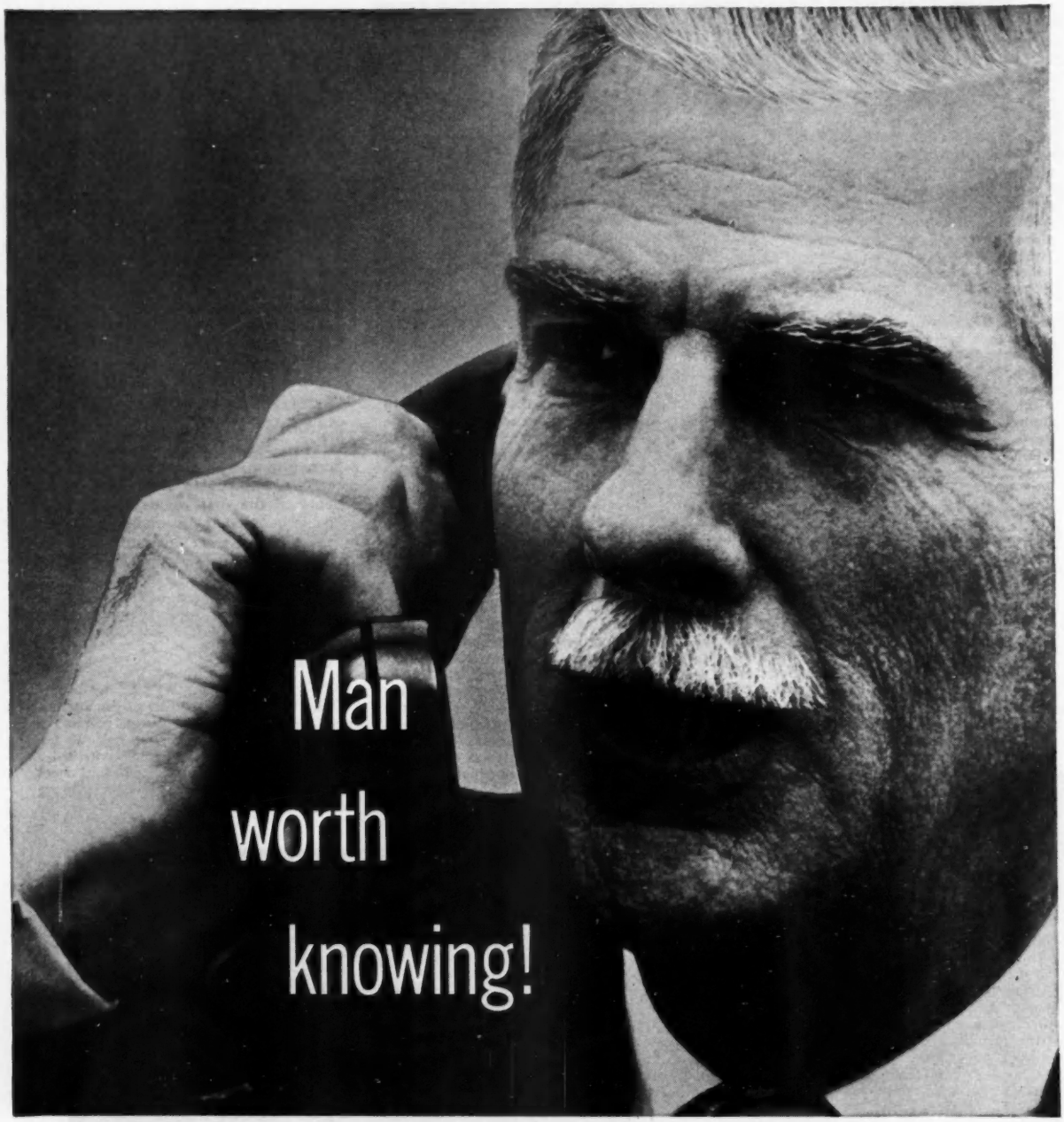
Installation of equipment to dope dye "Acrilan" during the fibre production process is now in progress at Chemstrand's new plant in Coleraine, N. Ireland. Small weights of the first colour, black, were available in 3 den. 2 -in. staple by the end of the year. Larger quantities will be available in April. A later announcement will give details of supply of other colours, sampling lots of which will be available during the first quarter of 1960.

• • •

Record Wool Sales

Sales during the first half of the current Australian wool selling season reached a new record level. The first half of the season closed on December 17 with sales in Adelaide and Brisbane. Sales of wool up to the end of November earned more than £117 million sterling.

This photograph shows a quantity of a new proofed "Terylene" ventilation ducting which was recently installed at Parsonage Colliery, Leigh. The N.C.B. has now placed an order for 30 miles of this ducting



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Gas at Work in Industry

An exhibition illustrating "Gas at Work in Industry" will be held at the Royal Horticultural Hall, Westminster, March 1 to 12. As in 1957 the exhibition is sponsored by four of the Area Gas Boards —Eastern, North Thames, South Eastern and Southern. How gas continues to meet the demands of modern industry will be demonstrated by working plants, models, photographs, films, etc. Atomic energy, radar, television, aircraft, rockets are among the industries which make use of gas.

There will be demonstrations of metal melting, tinning, die-casting, and special purpose plant for the clean heat treatment of metals. Drying operations by means of direct and indirect plant will be seen, and an infra-red plant will carry out paint finishing operations.

* * *

Funds for Wool Drive

The Australian Wool Bureau has recommended record expenditure on wool promotion in 1960-61, with Europe, the U.S. and Japan as the main targets. The Chairman of the Bureau, Mr. W. Gunn, said the decision to recommend more money for wool promotion arose from the lower prices for wool in the last two years, which were a warning against complacency. In the current year, the International Wool Publicity and Research Fund, financed by Australia, New Zealand and South Africa, has budgeted for an expenditure of £1,800,000 sterling on wool promotion. Australia is providing 62% of this amount. Apart from the overall promotion campaign, the Australian Wool Bureau will begin an immediate survey of Australia's wool selling prospects overseas, with special attention to the wool-consuming potential of Asia, including China and India.

* * *

Wool Demand

Population increases in the higher and medium income countries should strengthen the long-term demand for wool at satisfactory prices, forecasts the Australian Bureau of Agricultural Economics. But it is believed that the under-developed countries, apart from Communist China, are not likely at present to spend much more on woollen textiles. Short-term wool prices are expected to improve at the present rate of wool consumption if the U.K. clears its wool stockpile, and if the amount offered for sale lessens in the second half of the Australian selling season. World consumption of wool is expected to rise by nearly 9% over last year's record high figures. The Bureau adds that demand and supply should just about balance, leaving little chance of a drop in prices due to stockpiling.

* * *

New Reactive Dye

Procion Brilliant Red 8B, the latest addition to I.C.I. Dyestuffs Division's range of reactive dyes, is a homogeneous colour which on cellulosic fibres gives novel brilliant bluish red shades of excellent building-up properties, much bluer in tone than the shades obtained from Procion Brilliant Red 5B. The new dye is similar to the latter product in light fastness and has the great advantage of possessing better fastness to hypochlorite bleach liquors.

Procion Brilliant Red 8B is eminently suitable for batchwise application on the jig, winch, beck or in package-dyeing machines at low temperatures, being of special interest as a basis for full bluish red, wine and bordeaux shades. It is also very amenable to application by pad (alkali) – batch (cold) processes and by the various continuous methods recommended for use with Procions of the cold-dyeing type, its behaviour in all these being very similar to that of Procion Brilliant Red 5B.

* * *

The first consignment of Picanol high speed automatic looms is shown here during unloading at Preston Station. Mr. R. S. Maynard, Picanol's U.K. representative, is seen watching the operation. This 103 in. reedspace model, weighing 2½ tons, is designed to run at 145 p.p.m.

U.K. Wool Textile Output

The British wool textile industry acquired 1,100 new workers during November last. At the end of 11 months of 1959, wool consumption in the U.K. had exceeded by approximately 5% the total for the whole of the previous year. Wool top production—which promises to set up a new yearly output record—was already 7% higher than the total for 1958. Other new facts from the Wool Industry Bureau of Statistics show that the rate of wool consumption in the United Kingdom for November last was 2% lower than in October, but 6% higher than a year earlier. Top production was 3% below that of October but 9% higher than in November, 1958. Worsted yarn delivery rate was 10% higher than a year ago, and the woven wool cloth delivery rate 5% higher. November output figures were: Wool consumption, 44·08 million lbs. (clean weight); top production 29·49 million lbs.; tops drawn, 19·58 million lbs.; worsted yarns delivered, 21·40 million lbs.; woven wool fabrics delivered, 32·94 million sq. yds.; blankets delivered, 3·02 million sq. yds.

New Companies

Remnant Shop (Plymouth) Ltd. Private. Reg. Nov. 20. Capital £2,000 in £1 shares. Textile merchants, etc. Registered office: 98 Cornwall Street, Plymouth.

Craco (Lancs.) Ltd. Private. Reg. Nov. 23. Capital £900 in £1 shares. Manufacturers and merchants of chemicals. Registered office: 120 St. Anns Road, Prestwich, Manchester.

J. H. Saleh Ltd. Private. Reg. Nov. 24. Capital £1,000 in £1 shares. Textile merchants and manufacturers, importers and exporters, etc. Registered office: 3 York Street, Manchester 2.

J. Berridge and Son Ltd. Private. Reg. Nov. 25. Capital £1,000 in £1 shares. Waste products merchants, manufacturers of yarns, fabrics, etc. Registered office: Junction Mills, Sutton-in-Ashfield, Notts.

Nigideal Sewing Co. Ltd. Private. Reg. Dec. 3. Capital £1,000 in £1 shares. Makers up, manufacturing clothiers, etc. Registered office: 41 Princess Street, Waterfall, Blackburn.

Victoria Processing Co. (Liversedge) Ltd. Private. Reg. Dec. 3. Capital £1,000 in £1 shares. Textile processors, converters, manufacturers, etc. Registered office: Victoria Mills, Littletown, Liversedge, Yorks.

Hillel Trading Co. (Textiles) Ltd. Private. Reg. Dec. 9. Capital £20,000 in £1 shares. Manufacturers, importers and exporters, dealers in worsted yarns, tweeds, cloths, etc. Registered office: 57 - 61 George Street, Manchester.

John G. Wilkinson (Textiles) Ltd. Private. Reg. Dec. 9. Capital £2,000 in £1 shares. Importers, exporters, merchants, manufacturers and dealers in rayon, silk, etc. Registered office: Imperial Buildings, 56 Kingsway, W.C.2.

Henry Cullingworth and Sons (Dewsbury) Ltd. Private. Reg. Dec. 7. Capital £75,000 in £1 shares. Auctioneers, commission agents, brokers and salesmen of property, machinery, rags, wool, noils, shoddy, etc. Solicitors: Whitfield Son and Hallam, 29 Union Street, Dewsbury.

Horwitz-International Ltd. Private. Reg. Dec. 10. Capital £1,000 in £1 shares. Textiles agents and manufacturers, etc. Registered office: 201 Gt. Portland Street, W.1.

Crofton Yarns Ltd. Private. Reg. Dec. 11. Capital £10,000 in £1 shares. Manufacturing, spinning, twisting, combing, weaving or processing cotton, wool, etc. Registered office: Vale Mills, Oakworth, Keighley.

Commonwealth Curtain Company Ltd. Private. Reg. Dec. 14. Capital £10,000 in £1 shares (6,000 ordinary and 4,000 6% non-cumulative redeemable preference). Manufacturers and dealers in curtains, curtain fabrics, etc. Solicitors: Elvy Robb and Co., 16A St. James's Street, S.W.1.

Serdye Ltd. Private. Reg. Dec. 15. Capital £10,000 in £1 shares. Developers, manufacturers and dealers in all kinds textile machinery, and bleachers, dyers, hosiers, etc. Solicitors: Wells and Hind, Nottingham.

J. McAndrew and Son Ltd. Private. Reg. Dec. 15. Capital £4,000 in £1 shares. Cotton and cotton waste dealers and merchants, etc. Registered office: 9 Queen Street, Oldham, Lancs.

Olympic Carpets Ltd. Private. Reg. Dec. 15. Capital £500 in £1 shares. Manufacturers and dealers in carpets, etc. Registered office: 43 Trinity Street, Huddersfield.

THE

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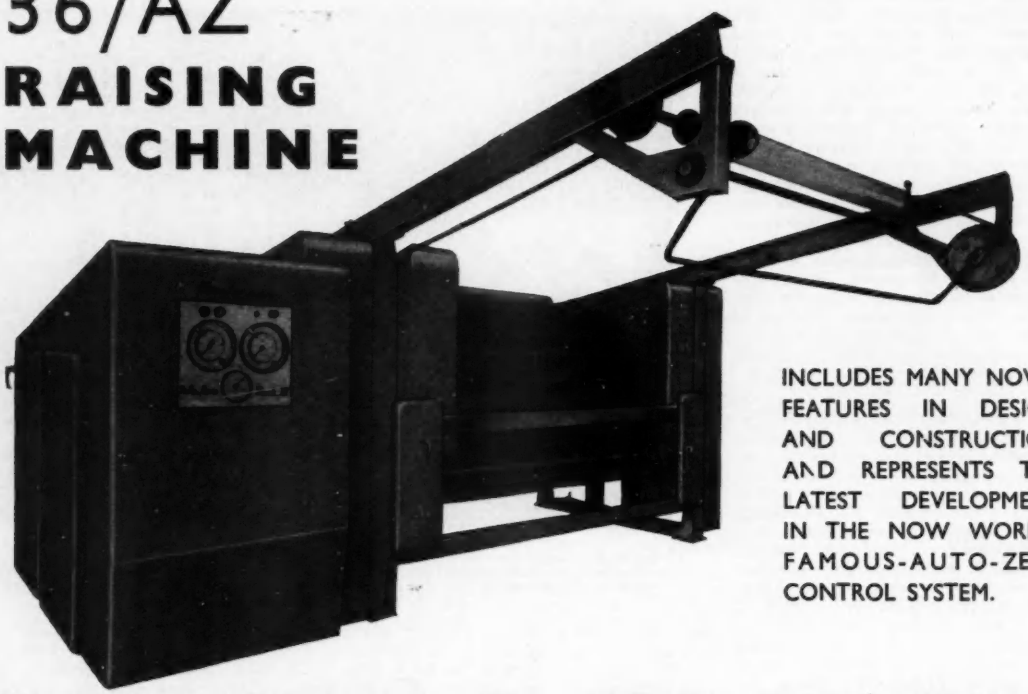

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RECENT TEXTILE PATENTS

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805,306 Detecting Critical Values for Feed-Rate of Yarn

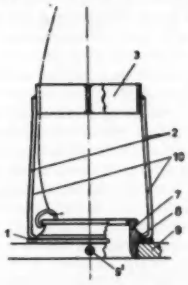
SOCIÉTÉ D'APPLICATIONS GÉNERALES D'ELECTRICITÉ ET DE MÉCANIQUE, *6 Avenue d'Iléna, Paris* (16e), *France.*

Apparatus for detecting an upper or lower critical feed-rate of yarn, comprises a pulley driven by the traction of the material without slip, the pulley being mounted on an electrically conducting spindle with the interposition of an electrically insulating sleeve. The spindle is connected to one terminal of an external electric circuit, whose other terminal is connected through with the pulley. Centrifugal weights are located in a recess of the pulley, spring means opposing radially outward displacement of the weights, and electric contacts are operated by the weights for breaking or making electrical connection between the pulley and the spindle when the speed of the pulley attains a critical value.

805,271 Balloon Control on Ringframes

E. EBENAUER, *Unterkotzauer Weg* 24, *Hof/Saale, Germany.*

A device for constricting the balloon in ring spinning and doubling frames. The internal diameter of disc 1 corresponds to the bore provided in the ring rail 9 for the rings 7. The disc is supported between the ring rail and a collar 8 which is provided on the ring. A screw 9^1 or a clamping

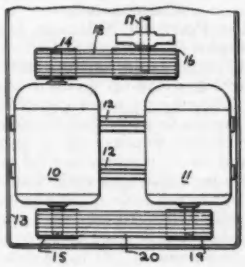


device is provided for securing the ring on ring rail. The constricting hoop 3 is arranged coaxially with the disc during manufacture and there is therefore no need to centre the constricting hoop. In order to clear spinning fly from the traveller, the edges 10 of the support legs 2 are sharpened and are arranged in the position of fly removers with respect to the traveller.

805,341 Double Motor Drive for Ringframes

ENGLISH ELECTRIC CO. LTD., *Queens House, 28 Kingsway. London, W.C. 2.*

Driving means for ring frames and is concerned with a drive including two electric driving motors arranged to provide different speeds according to which of the two motors is energized. The motors providing the higher and lower operating speeds are indicated at 10 and 11 respec-



tively, the motors being mounted side by side on slide rails 12 mounted on an extension 13 of the frame bedplate. The motor 10 has a double shaft extension, a pulley 14 being fitted to the extension adjacent the frame and a pulley 15 being fitted to the other extension. The pulley 14 is coupled to a pulley 16 on the frame shaft 17 through Vee belts 18, whilst pulley 15 is coupled to a pulley 19 on the motor 11 through Vee belts 20. Switch means (not shown) are provided for selectively energizing the two motors, the motor 11 being energized for the lower speed, the drive then being transmitted to the frame through the shaft of motor 10, and only the motor 10 is energized for the higher speed, the drive then being transmitted directly from this motor to the frame.

805,434 Waste Prevention on Doubling Machines

TWEEDALES AND SMALLEY (1920) LTD., *Globe Works, Castleton.*

Auxiliary mechanism for retaining the waste preventor stop means of a doubling machine in an inoperative position, the mechanism comprising a series of resiliently yieldable stop members which are adapted to permit any one or more of the stop means to remain in operative position when the auxiliary mechanism is moved into its retaining position. The stop members comprise leaf springs which are adapted to be moved into and out of engagement with the stop means.

805,435 Drawing, Combing and Spreading Hemp, etc.

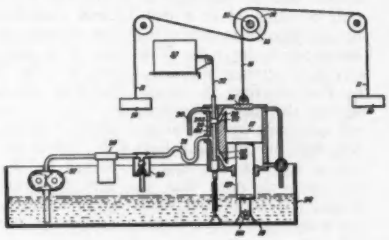
PLYMOUTH CORDAGE CO., *Court Street, Plymouth Massachusetts, U.S.A.*

A fine spreader for drawing, combing and spreading hemp, jute, sisal, etc., comprising a low speed screw-operated fibre drawing, combing and spreading unit having a series of faller bars and means for advancing them at a predetermined speed. A chain bar fibre drawing, combing and spreading unit has a series of gill bars with means for advancing them at a greater speed than the faller bars. The two units are arranged end to end so that the pins of the gill bars move into fibre engaging position in the same location as that in which the pins of the descending faller bars begin to withdraw from the fibres. In this way fibre delivered by the faller bars is immediately received for draft by the faster moving gill bars.

805,542 Traverse-Mechanisms for Spinning Machines

T.M.M. (RESEARCH) LTD., *Hartford Works, Oldham.*

An improved traverse mechanism for spinning or twisting machines having rising and falling ring rails, or spindle rails. The ring rails 10 are connected by straps 11, 11 with a pulley 12 fixed on the lifter shaft 13, which also carries a pulley 14 connected by strap 15 with a slidable cylinder 16 of the hydraulic motor by which the movements of the ring rails are effected. The rails are raised by a downward pull of the strap and are allowed to fall by gravity when the cylinder is raised. The cylinder houses a piston 17 which is anchored to a base 18 by a clevis joint connection 181 to the end of the piston rod 171, the cylinder being arranged for sliding movement on the piston. The cylinder is provided with a valve-chest 191 housing a



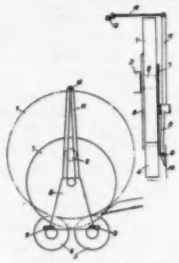
piston-type slide valve 20; a pressure supply pipe 21 is coupled to the valve-chest and the land 203 of the valve spool is arranged to co-operate with the upper inlet port 22, which communicates by the passage 24 with the chamber on the upper side of the piston. The inlet port 23, leading to the chamber by the passage 25, remains constantly open to pressure. The pressure supply line 21 is supplied with oil taken from a reservoir 26 under pressure by a constant delivery pump 27 by way of a filter 28 and a pressure control relief valve 29. A cylinder exhaust port 30 is connected with the reservoir providing in certain circumstances a connection with the upper cylinder chamber. The valve spool 20 is connected through a linkage 32 with a control mechanism 33 which is designed to vary the movements of the spool so as to produce the desired package build. The cylinder chamber beneath the piston is maintained constantly in communication with the supply line 21, and a downward force is exerted continuously on the cylinder. To maintain equilibrium, downward force must be balanced by an upward force due to pressure in the chamber above the piston and to accomplish this the cylinder will move downwards

until the upper chamber port 22 is uncovered to an extent such that the product of the upper chamber pressure and the full piston area is equal to the product of the lower chamber pressure and the effective lower chamber area.

805,641 Jute, etc. Sliver Rolling

DOUGLAS FRASER AND SONS LTD., *Westburn Foundry, Arbroath, Angus.*

An improved machine for winding rolls of jute sliver in which the roll is wound on a centre and rotated by frictional contact with one or more driving rollers. 1 denotes a sliver roll wound on a centre 2 which is urged downwardly by a saddle 3. The roll is rotated by frictional contact with a pair of driving rollers 4, 5, and 6 denotes a non-rotatable cheek plate bearing on one end of the roll. 7 denotes a disc so mounted on an arm 8 that a part only

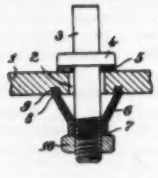


ot one face of the disc bears on the associated end of the roll. The arm 8 is connected at its lower end to brackets 9 secured to the machine frame 10. The upper end of the arm is connected by a pair of links 11 to a rod 12 and operable by a crank 13 to move the arm towards or away from the roll. The rod 12 is contrived to sustain the arm 8 and the disc 7 in the position in which the disc bears against the part of the associated end of the roll adjacent to the point of contact of the roll with the driving rollers 4, 5. When the roll is rotated, the disc is rotated by the roll in such wise that the disc prevents lateral spread of the sliver while exerting the minimum of frictional restraint on the roll.

805,642 Damping Vibration in Spindles

SKF KUGELLAGERFABRIKEN GESELLSCHAFT MIT BESCHRANKTER HAFTUNG, 13 *Ernst Sachs Strasse, Scheinfurt am Main, Germany.*

Describes improved mounting of spinning and twisting spindles. The spindle rail 1 has a bore 2 through which the spindle base 3 reaches. The diameter of the bore is greater than the outer diameter of the spindle base and permits radial movements of the latter. The spindle base has a flange 4 and to provide resilient mounting for the base 3, a washer 5 made from resilient material is located between the spindle rail and the flange. Below the rail there is provided a tapered resilient sleeve 6 which, at one end 7, embraces the spindle base, at its other end 8, the sleeve



bears against a shoulder 9 formed by a groove in the lower surface of the spindle rail whereby the sleeve is secured against radial displacement. A nut 10 on the spindle base serves to compress the sleeve and to secure it on the base. There is no rigid part of the mounting to interfere with the freedom for the effective length of the sleeve 6 to be decreased and if desired, the nut 10 can be adjusted during the operation of the machine.

805,749 Bleaching by Peroxygen Compounds

E. I. DU PONT DE NEMOURS AND CO., *Wilmington* 98, *Delaware, U.S.A.*

An improved, rapid, and efficient method for bleaching made-up goods of vegetable origin. The objects are accomplished by heating the goods while they are dampened with a bleach solution of a peroxygen compound at a temperature of at least 275°F. under conditions such that they do not dry out to any extent. In one example, a light-weight (0·7 lb./sq. yd.) muslin in the grey state was desized by an over-night enzyme treatment at 130°F. A number of desized samples were dampened with a 3% caustic soda solution by immersing in the solution and squeezing out excess solution until the solution retained equalled the dry weight of the sample. The samples were then subjected to the action of live saturated steam in an autoclave at 52 p.s.i.g. The temperature of the samples rapidly reached the temperature (300°F.) of the steam and were held at that temperature for only 5 seconds. After washing thoroughly 5 times with distilled water, the samples were immersed in a bleach solution containing 0.9% H_2O_2, 1% 42° Bé sodium silicate solution (10% Na_2O, 25% SiO_2, 65% H_2O) and sufficient caustic soda to give a *p*H of 10·7, then wrung out so as to give a liquor to goods ratio of 1 : 1. The samples were then returned to the autoclave and again heated for only 5 seconds at the temperature of saturated steam at 52 p.s.i.g. (300°F.). After washing, drying and ironing on a mangle, the samples were found to have brightness ranging from 90.6 to 91.8 and an absorbency not greater than 1 second. Mote removal was complete in all samples.

805,783 Identifying Spools in Weaving Axminster Carpets

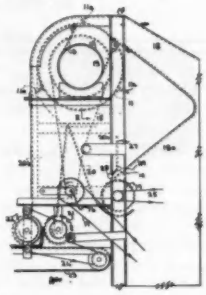
JELLEYMAN AND SONS LTD., *Townshend Works, Kidderminster.*

Identification of spools in the weaving of Axminster carpets consists in providing openings in the end cheeks of the spools and inserting through openings a tail end of a label of cardboard having a head for carrying an identification symbol and a tail from which the head is separated by a short waist portion, and binding the tail by the pile yarn. The tail is so shaped and dimensioned in relation to the opening that it will not pass through the opening in the position it occupies.

806,203 Constant Rate Fibre Feeder

BRITISH COTTON INDUSTRY RESEARCH ASSOCIATION, *Shirley Institute, Didsbury, Manchester* 20.

Improved fibre feeders for bale openers, hopper openers, etc. A framework supports a perforated cylindrical cage 11, the cage being adapted for rotation about end bearings 12, connected by ducts to a fan. Mounted on the outside of the cage are flaps 11*a* which act as seals against casing 14 and as wipers. Between the end bearings is a mouthpiece 13, and the cage is mounted in casing 14 and is driven by belt 15 from a countershaft 16 in turn driven by belt 17 from a rotating member of the preceding machine. Leading to the upper part of the casing is the inlet duct 18 for delivery of fibre suspended in air to the suction cage and part of the duct returns at



18*a* in association with a toothed drum 19 below part of the cage. Below the other part of the cage and separated from the drum by an adjustable partition 20 forming on one side a fibre collecting chamber 20*a* and on the other side a feed box 20*b*, is a pair of delivery rollers 21, 22 located above a lattice 23. The two rollers are driven from the lattice by belt 24, the lattice being driven from a receiving machine, whilst the drum is driven by belt 25 from the preceding machine. Control of delivery of the preceding machine is effected by a partition 27 which is normally urged by counter-weight 28 to a raised position but is adapted to be movable by weight and pressure of material accumulated in the chamber 20*a*. The shaft 29 carrying the partition is connected to electric switch mechanism which controls the speed of the preceding machine or operates to stop and start the same.

806,371 Loom Shedding Motions

BUTTERWORTH AND DICKINSON LTD., *Globe Iron Works, Burnley.*

A loom shedding motion comprises two heald shafts and two lifter members attached to the lower portion of each heald shaft. The lifter members raise and lower the heald shafts, the lifter members for both shafts being operated from a single follower actuated by a cam, and the connection from the follower to the lifter members comprising lever and link mechanism which provides equal and opposite movements for the two heald shafts. Preferably the lever and link mechanism includes two oppositely acting link members so that in one direction one is in tension and the other is in compression.

806,536 Continuous Bleaching

I.C.I. LTD., *Imperial Chemical House, Millbank, London, S.W.*1

A rapid and continuous process for the bleaching of cellulosic materials which comprises the following sequence which is carried out in a continuous manner, preferably at open width. (1) Continuously and rapidly passing the goods through a bath of trichloroethylene or perchloroethylene where they are degreased and dewaxed, any excess of solvent carried out of the bath being eliminated by passage of the cloth through hot water. (2) Passing through a bath of acid hypochlorite solution at temperatures up to 35°C., at a pH of less than 5·5 and preferably below 4·5, the amount of available chlorine in the

solution being in the range 0·5 gm./litre to 15 gm./litre, then rinsing with cold water and finally (3) passing through a bath of an alkaline solution of a peroxygen compound at a pH of at least 10 and subsequently steaming to promote desizing and bleaching. In one example a length of grey loomstate cotton duck weighing 7 oz./square yard was passed at open width through a vessel containing trichloroethyene maintained at its boiling point, the time of immersion being 30 seconds. The cloth was then passed through water at a temperature of 85°-95°C in order to remove solvent, the period of immersion being 20 seconds. The cloth was then passed through a solution containing 2 grams/litre of chlorine gas at a temperature of 20°C. the pH value of the solution being approximately 1·8 and the time of immersion being approximately 30 seconds. The cloth was then rinsed in cold water, after which it was squeezed through heavy rollers and then padded in a solution containing 15 grams/litre sodium peroxide, 5 grams/litre sodium silicate and 0·5 grams/litre of a wetting and scouring agent consisting of an octylated cresol condensate with ethylene oxide. The nip of the mangle was adjusted so that the cloth retained approximately 1½ times its weight of liquor. The cloth was finally steamed for 2½ minutes and then rinsed in hot water followed by cold water. The cloth was dried and tests showed that it was free from starch and extremely absorbent. The cloth was well bleached and sufficiently free from motes and seed to be suitable for dyeing in pale shades or printing. The amount of degradation of the cellulose was satisfactory low, the fluidity determined by the standard cuprammonium method being 3.4.

807,072 Centre Weft-Fork Motion

H. CLOUGH, 57 *Norfolk Street, Glossop.*

An improved construction of centre weft-fork motion, readily adaptable to both Lancashire and automatic looms. The fork-attachment frame carries a cam and adapted to co-operate alternatively with two spaced arms on the fork "tippler." One side of the cam has pivoted thereto a lever biased towards a position in which it projects beyond the cam profile, such profile causing a positive movement of the cam in one direction to act upon one of the fork arms and raise its prongs clear of the shuttle path as the sley retracts. Return movement of the cam under spring action allows the fork to drop to an operative position defined by a stop on the frame, the weft (if present) checking descent of the fork so that the prongs of the latter are lifted somewhat by engagement of its operative arm against the lever. Absence of weft permits the last-mentioned arm to enter a notch in the cam and thus lock it against further return movement. The spring-loaded actuating cam is fixed to a shaft adapted to be oscillated by engagement of an arm against a stationary abutment on the loom. Such engagement is continuous unless the cam becomes locked by the weft-fork arm in which event a dagger also fixed to the shaft is held in position to actuate "knock-off" means as the sley comes forward.

807,185 Sizing Synthetic Yarns

MONSANTO CHEMICAL CO., 1700 *South Second Street, St. Louis, Missouri, U.S.A.*

A method of sizing linear terephthalate polyester yarns comprises applying solution of a water-soluble salt of an interpolymer of a conjugated 1·3-diene and acrylic and/or methacrylic acid, the interpolymer containing at least 25 mol % of the conjugated 1·3-diene. In one example, an interpolymer consisting of butadiene and methacrylic acid is prepared using an emulsion made from:

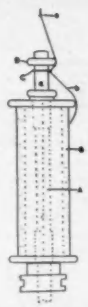
Butadiene	53	parts
Methacrylic Acid ..	47	,,
Potassium Persulphate ..	1	,,
Emulsifiers (1)	5	,,
Dodecyl Mercaptan ..	1	,,
Water	220	,,

(1) Equal weight mixture of Sodium Dioctylsulphosuccinate and the Sodium Salt of Alkylated Aryl Polyether Sulphonate. The polymerisation is carried out for 40 hours at 50°C. and the polymer is obtained in the form of a stable latex. A slight stoichiometric excess of concentrated ammonium hydroxide is added to the latex. This coagulates the latex, but the coagulated polymer dissolves. The resulting solution is diluted to 12 weight % solids and has a viscosity of 31 centipoises at 25°C. The pH of the solution is 7·5. Polyethylene terephthalate warp yarns are sized employing the 12% solution of the ammonium salt of the butadiene-methacrylic acid interpolymer. The yarns are drawn through the solution at a rate of 10 to 20 yards a minute and passed through squeeze rolls at a pressure of 10 to 20 pounds per linear inch on the yarn. The yarns are dried by passing them over a series of five drying cans in tandem, the temperatures of the cans being respectively 175°F., 180°F., 195°F., 185°F., and 130°F. The yarns have a sizing of about 3% by weight of the butadiene-methacrylic acid interpolymer. The sizings are tough and abrasion resistant and the yarns can be easily and efficiently woven using standard weaving techniques.

807,532 Improved Uptwisting Method

ENGLISH SEWING COTTON CO. LTD., *Arkwright House, Manchester* 3.

Describes means for enabling a very high twist to be inserted in yarns, particularly those of synthetic fibres, in uptwisting machines. A is the spindle and B is a yarn package from which yarn *b* is unwound. A ring C of metal or rigid plastic is located on the spindle and should be as small and light as possible subject to the condition that it is of sufficient inner diameter to allow of the passage of the yarn between it and the spindle without contacting the surface of the spindle. The



bobbin for the yarn is of such length that a sufficient length *a* of the spindle extends beyond the package to receive the ring C. To limit the vertical movement of the ring and prevent it from leaving the top of the spindle during the twisting operation a collar D is secured near the top of the spindle, the outer diameter of this collar being greater than the outer diameter of the ring. The yarn after passing upwards through the ring comes into contact with the outer surface of the collar and it is advisable that the surface both of the ring and of the collar should be as smooth as possible to prevent damage to the yarn. During twisting the path of the yarn is from the package on the spindle, under the ring and thence to the guide *e* which lays it on the take-up package.

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